

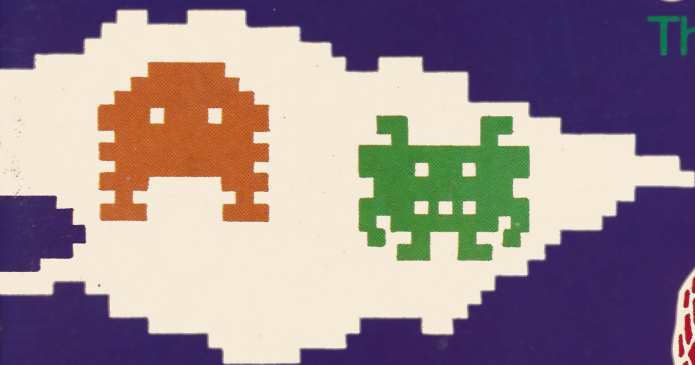
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Vol 2 No 11 UK £1

# COMMODORE

COMPUTING INTERNATIONAL

The Independent Commodore Magazine



**MODEM SURVEY**

**CULT OF THE  
PROGRAMMER**

**INSIDE THE 64**

**PLUS**

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FOR THE VIC 20,  
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**\* VIC CHIP  
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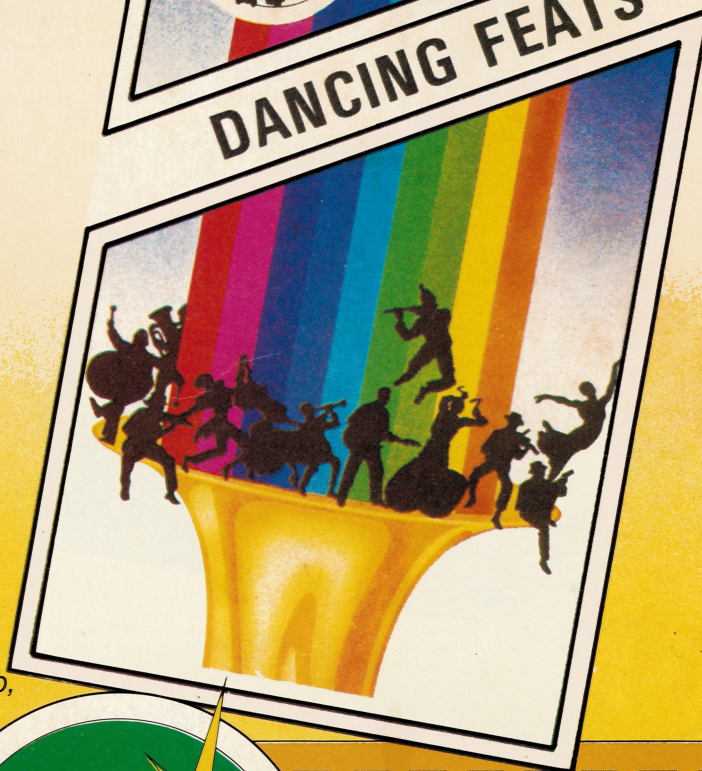
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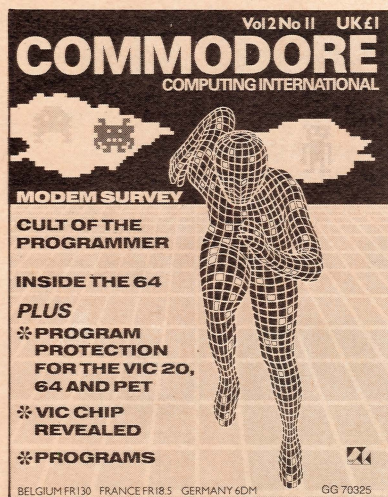
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# COMMODORE

COVER STORY

COMPUTING INTERNATIONAL

APRIL 1984



Ever wondered what a computer programmer is really like? Find out in our new series – Cult of the Programmers.

Published by Nick Hampshire Publications, 167-169 Great Portland Street, London W1.

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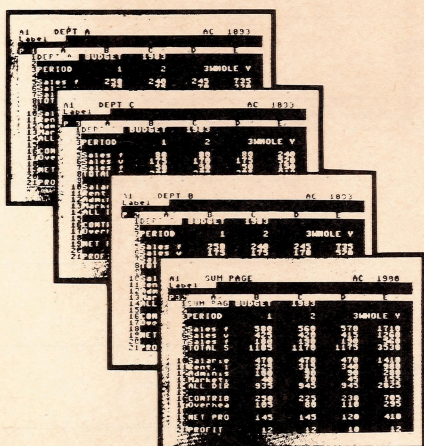
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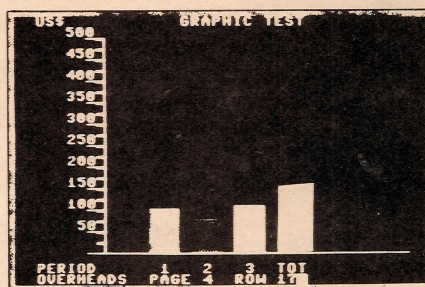
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Thinking ahead

## Next Generation from Commodore

Commodore are now making public announcements about their long rumoured new 16-bit machines. Stories have been circulating since the end of last summer about Commodore's intentions to produce a 16-bit machine, but the company have been reluctant to say anything in public.

They have now announced in the US that they will be using the UNIX-like Coherent operating system in a new range of Z8000-based computers which will be called the Next Generation. The formal announcement of the new series, with 256K RAM and a single or dual floppy disk drive, is expected in May.

The Z8000 microprocessor

chip is manufactured by Commodore under a license granted by manufacturers, the Zilog Corporation. All Commodore's previous computers – with the exception of the 264 and the V364, both launched only recently – have used the 6502 chip.

In the circumstances the launch of the 264 and V364 seems even more puzzling. They are based on the new 7502 chip which is an 8-bit microprocessor and it's that fact which confused many industry experts who were convinced that Commodore were about to launch a 16-bit machine.

It looks now as if the two

major operating systems competing for dominance in the 16-bit market are UNIX, or UNIX-like systems such as Coherent, and CP/M 86.

Opinion at the moment seems to be swinging in favour of UNIX and many experts expect UNIX to become the predominant operating system in years to come.

Commodore look to be planning a similar marketing policy for their Next Generation. So far all they have said is that the price will be lower than any comparable system. But that alone is enough to convince many in the industry that Commodore intend to produce an upmarket machine at a middle market price.

## Royalty

Commodore Business Machines (UK) Ltd have become the first manufacturing company to be granted the Royal Warrant of Appointment by Her Majesty the Queen for computer business systems.

The Warrant has been effective since 1st January 1984 and carries the legend "By appointment to Her Majesty the Queen", manufacturers of Computer Business Machines (UK) Limited Slough" and it will last for an initial period of ten years.

Commodore's Corby factory produces over 5,000 microcomputers a day. The company employs over 300 people and when they open the European manufacturing and distribution headquarters at Corby, nearly 1000 jobs will be created.

## 5th International Commodore show

The 5th International Commodore Computer Show is to be held at the Novotel London, Hammersmith (formerly the Cunard International Hotel) from the 7th to the 9th June 1984.

The show is an ideal opportunity for all Commodore owners to see the latest Commodore products on display. The portable SX-64 (which just lately has been the subject of so many articles it must be on par with Princess Di) will be featured as well as the even newer 264. Features of the 264 include 121 colours, inbuilt software and a full travel keyboard. It will be one of the main attractions of the show.

Over 400 exhibitors from Britain, Europe and the USA will be there, demonstrating the latest range of business, educational, leisure software packages and of course the most recent peripherals for the

VIC 20, CBM 64 and the SX-64.

Vicsoft will be demonstrating its full range of educational software including the Teach and Test series. Commodore approved product suppliers will be demonstrating their business software for use on the CBM 64, the 700 and 8000 series. More specifically there is a section for CBM 64 owners which will be demonstrating the current business and home management application software.

Commodore's aim is to appeal to the whole family and a program of special events is being arranged. Well-known TV and radio personalities will be attending, competitions will be arranged and similar extra attractions are promised.

**Contact:** Granard Communications, 4 Babmaes Street, London SW1Y 6HD. Tel: 01-930 6711.

## High street price war

Last year, Commodore caused some discontent in the home computer market when they reduced the price of the CBM 64 from £345 to £230. During summer '83 this was reported at the Office of Fair Trading for alleged price-fixing, contrary to the 1976 Resale Prices Act.

Michael Mehdi, a former banker now running Crestmatt in London's Regent Street is currently selling about 400 CBM 64's a month. His price for the CBM 64 is £184.95, which quite considerably undercuts the High Street retail price of £199.95. The recommended retail price is actually £229.95. Crestmatt's marketing policy has angered Commodore and they are now refusing to supply his company with CBM 64's.

In comparison to most competitive marketing policies, Mehdi is only doing what any other merchant would do –

compete with other traders by offering the lowest possible price. However, Commodore do not agree and Mehdi is currently consulting his solicitors on the matter.

Mehdi stressed that they are not involved with price matching and will not go lower than £184.95 even if some one claimed that they could get the machine for a lower price elsewhere.

It has been reported that Mehdi gets his 64 plus cassette unit for £168, but he was not prepared to confirm this, although he did say that his bank manager was fairly happy about the situation.

Will Commodore force him to up his price to what they consider to be a suitable retail price or will Mehdi maintain the right to quote a price, satisfying both the customer and his bank manager?

## Computer art competition

Anyone nursing ambitions of becoming a famous computer artist will be interested in the Commodore Computer Art challenge. Besides the prizes worth £150,000, the successful competitors will win a two-month scholarship worth £5,000 to continue studies in computer art. Exhibitions of the finished work will be shown in major cities across the world, with the Commodore show being the first venue for exhibiting prize winning entries.

All you have to do is create a picture or screen image. There are two categories – still picture or dynamic graphics of not more than 60-seconds duration. The entries can be either representational or abstract.

Three age groups will be judged: under 12 years, 12-17 years and 18 years and over. All work submitted must be generated on either the CBM 64 or VIC-20 and must be capable of being displayed on Commodore computers. The closing date is 1st June 1984. All entries must be on floppy disk or cassette tape. Winners may be asked to demonstrate their skill on Commodore equipment and explain their methods and the development of their entry.

Professor Brian Allison of Granard Communications, artist Tony Hart and John Baxter of Commodore (UK) are among the judges of the competition. Qualities they will be looking for include imagination, originality, technical expertise and success in communicating the title of the work.

The first prize is the SX-64 with £1,500 worth of software and hardware including a colour printer/plotter and a Commodore monitor. The second prize is the SX-64 plus software worth £1,000 and the third prize is the Commodore 1526 printer, a monitor, two joysticks and £700 worth of

software. The results will be announced in the August edition of this magazine.

Think you can do it? For your entry forms send a s.a.e. to C.I.A.A.C., Granard Communications, 4 Babmaes Street, London SW1Y 6HD.

## Insurance scare

People with home computers and expensive software may not be covered under the terms of an ordinary household policy – that was the message disclosed in the third annual report of the Insurance Ombudsman Bureau.

Home computers may occasionally be regarded as commercial equipment and therefore are not covered by the average household policy. Check your policy. Also, if software and peripherals cost significant amounts, make sure that they are insured adequately as part of household contents.

If you are putting your computer to a profitable use – designing and selling software programs for instance, check if you should be insured under a commercial policy.

## New HQ

Melbourne House, the publishers of books and games have moved to larger premises to accommodate the company's expansion.

**Contact:** Melbourne House (Publishers) Ltd, Castle Yard House, Castle Yard, Richmond. Tel: 01-940 6064.

## Doubled

During 1983 the number of people with a home computer has more than doubled, according to survey report out this February.

The report, based on a survey carried out by Gowling Marketing Services, established that in January 1984, 11% of households owned computers compared with 4.9% in the same month last year.

Commodore is one of the top six models listed in the report and together with the other five accounts for 87% of the micros now in use.

Market growth of the computer industry exceeded expectations and prospects are bright for the software market where arcade and adventure games look set to take 70% of total software sales.

Copies of report can be obtained from Gowling Marketing Services, Britannia Buildings, Fenwick Street, Liverpool.

## Veto angers G.O.S.H.

The action of the Ministry of Defence in seizing a new anti-copying system has angered G.O.S.H. (The Guild of Software Houses), who are currently devising ways of combating software piracy.

The system was devised by JLC Data Systems. According to Nick Alexander of Virgin, "no-one has been able to develop a protective system that works." He said that "because of the Ministry of Defence's action it is not possible for us to examine the JLC Data System, but the very fact that the Ministry have embargoed it with a secrecy order seems to indicate that it should be taken very seriously."

However, Findfree, a new London based company, claim to have developed a copyproof system and will soon be offering a protection service for disk based on the Commodore machines. They are in the process of developing the dongle and hope to market the product in a few months time.

In addition they are working hard to keep the price under £2.

**Contact:** D. Tuttle, 46 Oxford Street, London W1N 9FJ.

## Summer show season

It's show time again as news reaches us of five approaching computer shows. There's Commodore's own show, of course, held on June 7-9. But before that date is the Manchester Home Computer Show to be held in Manchester's New Century Hall on April 5-7. Specialising in home computers, it will include the latest hardware and software.

There are two shows being held over the Easter weekend. The London Computer Show – April 19, 21 and 23 – is at the Central Hall, Westminster, Lon-

don. Attractions include a robotic conference display and a computers in education display.

Profits of the fair go to support the Association of London Computer Clubs which is sponsoring the event.

**Contact:** T Collins, Computer Marketplace (Exhibition) Ltd, 20 Orange Street, London WC2H 7ED. Tel: 01-930 1612.

Also being held over the Easter Weekend is the Personal Computer Games Show – April 20, 21 and 22.

Radio One's annual 'Music

Marathon' is also being staged at this show. A live broadcast will be attended by DJ's and rock superstars.

**Contact:** Solihull Conference Centre, Solihull, West Midlands.

Finally, the West Kent Amateur Radio Society are holding a Radio and Electronics Fair at the Royal Victoria Hall in Southborough on July 21.

**Contact:** D Green, 13 Culverden Down, Tunbridge Wells, Kent. Tel: 0892 28275.

# Commodore International Computer Art Challenge.



## £150,000 in prizes to be won!

**The Challenge.** Commodore Computers are pleased to announce their first International Computer Art Challenge, and invite entrants to submit their work for judging by June 1st, 1984.

Entries for this important new competition must be generated on Commodore 64 or Vic 20 computers, and may consist of either a still picture or of dynamic graphics of no more than 60 seconds duration.

There are three age categories: under 12; 12 to 17; and 18 years or over. All entrants must be able to demonstrate their skill on Commodore equipment and explain their methods and development of their entry if required to do so by the panel of judges.

Prizes in each of the 3 age groups and the 4 entry classifications (explained in the leaflet) are as follows:

**1st Prize.** £1,500 worth of Commodore equipment to the winner's choice.

**2nd Prize.** £1,000 worth of Commodore equipment.

**3rd Prize.** £700 worth of Commodore equipment.


In addition, winners will have the opportunity to see their work in a series of unique exhibitions across the world, and a special scholarship worth £5,000 will be awarded to one winner in each participating country to further his or her art education.

All entrants will receive a certificate of entry. There are no cash alternatives to any of these prizes.

**How to enter.** Leaflets with full details of the Challenge and the entry form are available at Commodore dealers, Commodore User Clubs, most major retail computer shops and at stores with a

computer department. In case of difficulty or for additional copies, please write to:

The Commodore International Computer Art Challenge,  
Granard Communications, 4 Babmaes Street, London SW1Y 6HD,  
using the coupon provided.

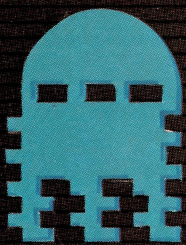
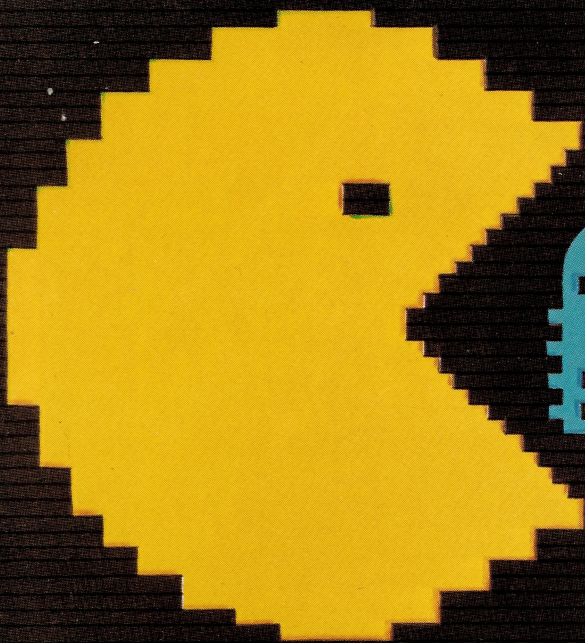
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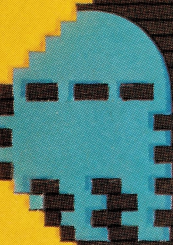
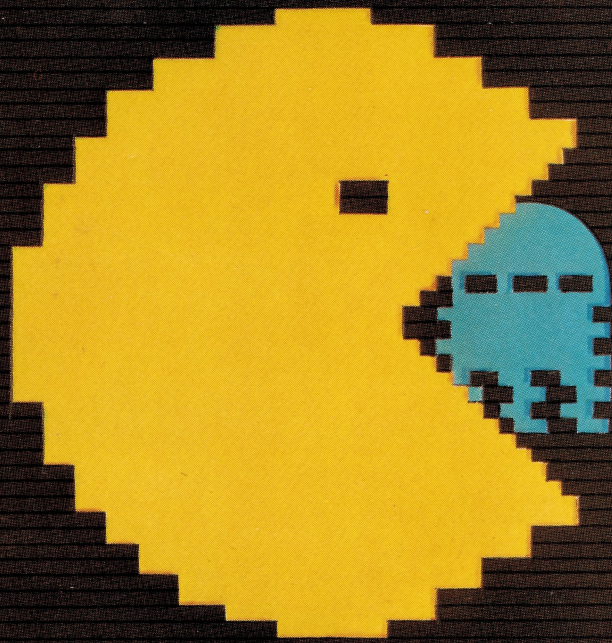
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"Gobble"



"Gobble"

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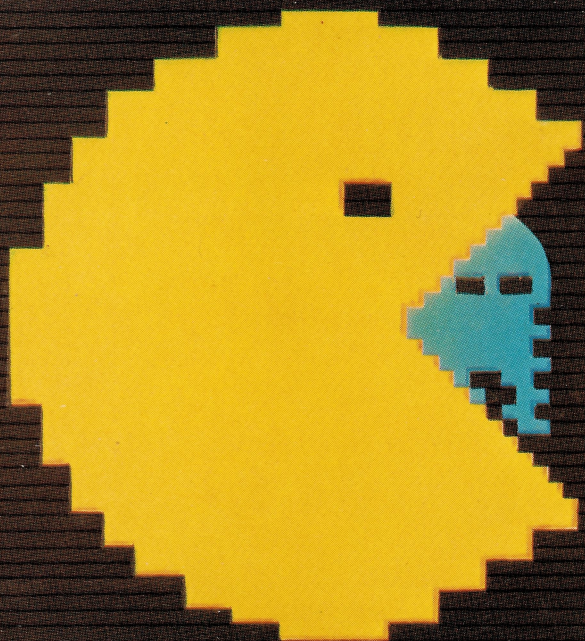
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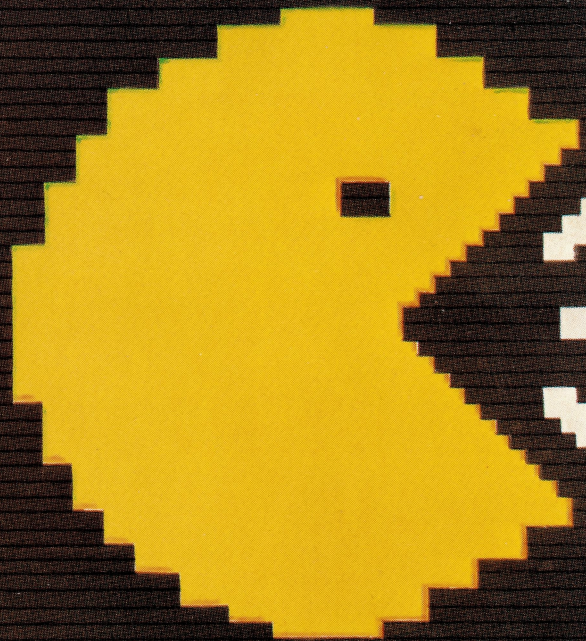
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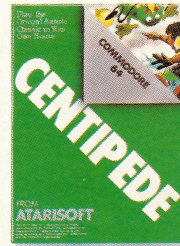
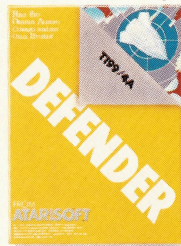
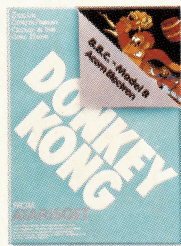
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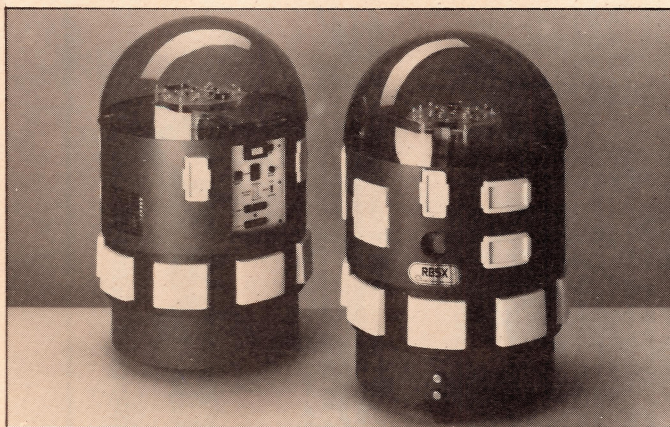
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## New look robot

The RB5X, the intelligent robot from the RB Robot Corporation has been given a new look corresponding to some of its new capabilities.

It is a fully programmable personal robot for home use and experimentation. Features include Polaroid Rangefinder (tm) sonar sensing, its own battery charger, circuitry and software that enables it to charge up when the batteries are low. Hardware options such as voice synthesis and a robotic arm are available.

The most important en-

hancement is on the interface panel. There is a socket for plugging in optional 2 or 4k pre-programmed software modules. The software is contained in an EPROM and includes a series of short programs.

The RB5X is available from selected dealers. In the US the robot retails for \$1795 and upgrade kits cost \$300.

**Contact:** RB Robot Corporation, 18301 West 10th Avenue, Suite 310, Golden, Colorado 80401. Tel: 303 279 5525.

## Juggler

Chinese Juggler from Ocean Software recently won a software competition arranged by Hungarian television in Budapest. The competition must have been challenging because there are virtually no home computers in Hungary!

Because of this all the entrants had to send their ideas in story board format. To develop their ideas the entrants were loaned home computers.

Oriental-style animation and fairground hurdy-gurdy music give prize-winning Chinese Juggler the game appeal. All the music was composed by the brother of one of the programmers. The game retails at £6.90.

**Contact:** Ocean Software Ltd, Ralli Building, Stanley Street, Manchester. Tel: 061 832 9143.

## Arcade

Arctic Computing Ltd are introducing a range of arcade games for the CBM 64. Appearing for the first time for the 64 are five games – Planet of Death, Inca Curse, Ship of Doom, Espionage Island and Golden Apple.

## Lite-up

Anyone with dark nooks and crannies in their Commodore equipment need no longer worry, as Inmac have produced a torch with a 12-inch flexible cord. It bends in any direction – even round corners – and costs £19.

The flex-lite is made of solid anodised aluminium and has a pocket clip. It is powered by penlight batteries.

**Contact:** Inmac Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

## Games

Audiogenic have launched a new range of disk based games for the CBM 64 and new SX-64. The five games – Frantic Freddie, Pegasus, Forbidden Forest, Aztec Challenge and Slinky all retail at £12.95.

They involve play on a number of different levels and the player has to successfully complete the first level before being allowed to progress any further. They are not easy and Audiogenic are providing a counselling service. Players reaching levels not covered in the manual should contact Audiogenic so that any experience of higher levels can be kept on file for reference.

**Contact:** Audiogenic Ltd., PO Box 88, Reading, Berks.



## Rack unit

The new AVS 1600 from Fidelity is billed 'to fit the needs of the modern family'. It is a rack system integrating a 16-inch colour television with an audio system.

Incorporated into the unit is a 3 waveband tuner, record player, stereo cassette deck, 24 watt amplifier and 2 speakers.

The monitor socket at the back accommodates the CBM 64 and VIC-20. Fidelity have also considered the needs of the cable and satellite systems of the future.

It costs £400 and will be available from leading stores and electrical retailers.

## Club

Cyber Robotics have developed a user club which will keep all buyers and users of their robots informed of new application software as it becomes available. Cyber are currently developing software that will make the computer and robot into a complete educational program.

**Contact:** Cyber Robotics Ltd., 61 Ditton Park, Cambridge. Tel: 0223 210675.

## 64 talks

Adman Electronics have launched a speech synthesiser for the 64 with the backing of a number of software companies. The first compatible title released is Bug-Byte's Twin Kingdom Valley, a game featuring 175 screens using hi-res graphics and sprites. Speech has now been added to the game and all text appearing on the screen is 'spoken' by Adman's speech synthesiser.

Other companies releasing compatible software include Voyager and Crystal.

Retailing at £49.95, the speech synthesiser uses the allophone construction of words. As each key is pressed it is voiced.

**Contact:** Adman Electronics, Ripon Way, Ripon Road, Harrogate, North Yorkshire HG1 2AU. Telephone: 0423 62642.

## Cabinet

Marcol Cabinets have designed a home computer cabinet to hold a CMB 64 or VIC 20. There is plenty of space for storing peripherals and software.

Supplied as a flat pack for £79.95 inc VAT and delivery, it has a teak effect finish. A deluxe version in polished wood and brass fittings is available for £180.

**Contact:** Marcol Cabinets, 8 Bugle Street, Southampton. Tel: 0703 731168.

# hardware

These prices include VAT and carriage. If software is ordered at the same time a further discount on hardware of 1% is offered for each £30 software bought (limit is 5% extra discount). For example, ordering £150 or more of software at the same time as special package (i) reduces its price by £11.50 to £218.50. Applies to hardware listed here only. Note we cannot guarantee to supply any product of Commodore's.

Product	OUR PRICE	Product	OUR PRICE
(a) Commodore 64	£195	(j) 1526 printer	£310
(b) 1530 cassette unit	£ 40	(k) package (a) + (b)	£230
(c) 1541 disk unit	£199	(l) package (a) + (c)	£390
(d) 1701 monitor	£210	(m) interface to convert any	
(e) MS801 printer	£199	(n) cassette recorder for 64	£ 25
		(o) use - it's excellent!	£ 25

For customers having difficulty obtaining copies of **COMPUTE!** and **COMPUTE GAZETTE**, we can supply these on subscription at £2.20 per copy which includes postage. We can also supply any book at normal retail price plus £1 p&p.

# software selection

Please note that the prefix (d) before a price denotes that the program is available on disk (for example d25). The prefix (r) (as in r29) indicates that the program is in cartridge form and costs £29.00. Tape program prices have no prefix. Thus (d29) indicates a disk version at £29.00 and a tape version at £16.00.

## WORD PROCESSING

**PAPERCLIP** (d90) is the most sophisticated and versatile word processing program for the 64. Very good too is **VIZAWRITE** (r78 d65) which also has a spell-check program **VIZASPELL** (d20) if bought with **VIZAWRITE**, else d65). But for casual wordprocessing of extreme sophistication we recommend **HOMEWORD** (d35) which is outstanding value and very easy to master. It uses 'icons' to symbolize menu options (as used by Lisa). Contains several really innovative features. Much further down the scale but ideal as a low cost text editor is **WORD WIZARD** (5.99). Compatible labelling programs are available.

## UTILITIES

**DISKEY** (d36) is a really powerful disk editor which enables you to manipulate fully your 1541 and files produced on it. **PROGRAMMER'S UTILITIES** (d14.99) surely represents the best value if you have a disk; sprite, character, and sound editors are provided in addition to a PET emulator, and disk copy utilities - a dozen in all! **COMPACTOR** (d10.50 8.50) cuts out all wasteful programming including HEMs and spaces. This can speed up programs and

salvage memory. Various good quality sprite and character editors are available including **SUPERFONT 4.0** (6.75), **SPRITE/GRAPHICS EDITOR** (5.99), **SPRITEMAKER 64** (6.75). On the music side there's **MUSIC COMPOSER** (9.99) **ULTISYNTH** (14.95) and **SYNTHESOUND** (25.025).

## PROGRAMMING AIDS

These range from improvements to C64 BASIC to actual programming aids. **SIMONS BASIC** (r50) adds 114 extra commands and facilities, and the rather better planned program **BC BASIC** (r50 17.95) does much the same. Best of the compilers and excellent value is **PETSPED** (d50). On the machine code front there are numerous monitors and assemblers the best of which is **MIKRO ASSEMBLER** (r53) but **MONITOR** (r29.95) **ASSEMBLER 64** (6.75) **ASSEMBLER DEVELOPMENT** (d24.95) **HESMBL 64** (r29) **MASTERCODE ASSEMBLER** (14.95) can all be recommended. If you want to learn about machine code programming we suggest **ASSEMBLER TUTOR** (d29.95 29.95) or Honeyfold's **BEGINNER'S ASSEMBLY LANGUAGE PROGRAMMING** (14.95).

## DATAFILES/DATABASES

Unquestionably the one program to have if you can afford it is **SUPERBASE 64** (d68) which we have on special offer by way of encouragement! This is a sophisticated programmable relational database. Think of what you would like your database program to do - and **SUPERBASE** will probably be able to do it! Very, very

This is a selection of some of the best programs for the Commodore 64 from a list of over 800 we can supply, covering the products of 100+ software houses from the UK, rest of Europe and the USA. A 20-page listing and later updates are available free to customers (otherwise 50p and large SAE. Add 50p p&p for orders under £20. (Europe £1 all orders).

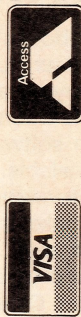
## RECREATIONAL

We can supply any of the popular games from established software houses and this includes an unbeatable selection of imported material. If there's a program for the 64... we can usually provide it! Look out for **ALICE IN WONDERLAND** (d27) and the definitive C64 **FLIGHT SIMULATOR II** (d35). Really good imports include **BLUE MAX** (d29 29) which has truly outstanding graphics and diagonal scrolling like **ZAXXON** (d29 29) which should be available soon. There's also **PROTECTOR II** (d25 25) **FORT APOCALYPSE** (d23 23) **PITSTOP** (r27.50) **JUMPMAN** (d27.50) and **JUMPMAN JUNIOR** (r27.50)... but there are many others! Interested in adventuring? Highly recommended are the following: **COLOSSAL ADVENTURE**, **ADVENTURE QUEST**, **DUNGEON ADVENTURE**, **SNOWBALL**, **TIME LORDS** and **TWIN KINGDOM VALLEY** (all 9.50 each) **THE HOBBIT** (14.50), plus **Infocons**, **ZORK**, **VIJILI**, **STARCROSS** (all d29 each) **WITNESS**, **DEADLINE**, **SUSPENDED**, **ENCHANTER**, **INFIDEL**, **PLANETFALL** (all d36 each).

Our list includes details of **EDUCATIONAL**, **ACCOUNTING**, **BUSINESS** and **GAMES** programs not possible to itemize here. PLEASE TRY US IF YOU ARE HAVING DIFFICULTY LOCATING A PROGRAM. Please make cheques/PO's payable to the Six-Four Supplies Company.

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ACCESS/VISA credit card hot-line:

(0227) 266289

If answering machine is in use be prepared to state program name, your credit card number and expiry date, your address and telephone number.

## Musical

Waveform have just launched a music synthesis package in Europe called the Musicalc 1. It first came out in the US a few months ago.

The program turns the 64 into a three-voice synthesizer with interactive real-time sequencing, slide controls, modulators and transposers. The package also drives TV loudspeakers, hi-fi systems or professional amplifiers to play back compositions. Templates and companion disks extend the package with 1000 more combinations of tunes and sounds per disk. In the future, extras including a musical scorewriter and keyboard will be available.

## Terminal

Terminal Software have released two new games – Star Commando and Plumb Crazy for the CBM 64. Both retail at £7.95. Star Commando is intended to have fast arcade-style action where attacking space people in 3D is the main aim while Plumb Crazy revolves around plumbers and water tanks.

## Tidy up

For people with a messy disorganised household yearning for some sort of order, Batteries Included might have just the job – a system of modules designed to cover every aspect of record-keeping activity in the home.

The Home Organiser Series is a system of program modules and each module is designed for a particular activity. Titles include household inventory, audio/video catalogue, stamps, home banking, address book, recipes and mail list. Page formats and classifications are laid out and there are no restrictions on filing data on disks.

**Contact:** Batteries Included, 186 Queen Street West, Toronto, Ontario M5V 121 Canada. Tel: 416 596 1405.

## Expand

SM Software have added a further expansion board to their existing one. The original added 64k to the 8032 transforming it into a 8096. With the second expansion board, the 8096 is modified and becomes a 8160 due to the additional 160k.

The expansion board costs £250 and has a one year guarantee.

**Contact:** SM Software, Raglan House, Long Street, Dursley. Tel: 0453 46065.

## Reduce screen glare

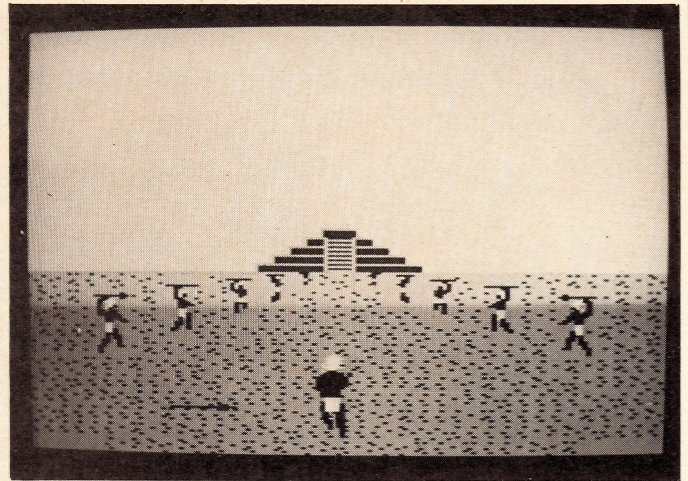
According to a nationwide survey, the glare from screen based systems has been creating health problems – backache, fatigue and eyestrain. The two causes of this are the reflected ambient light and inadequate contrast between the VDU's background and the lighted phosphor image. Two companies have introduced products to minimise this problem.

Cave Tab manufacture the polaroid CP-70, at £105, which is fitted to a Commodore VDU. It includes a self-adhesive mount which attaches to the screen surround and can be lifted off for cleaning.

**Contact:** Cave Tab, Tentor Road, Moulton Park, Northampton. Tel: 0604 47238.

Inmac make a filter called the Glare Sentry II. The filter is coated with an anti-reflective substance and the shatter proof glass can be fixed onto the screen using velcro fasteners. They cost £95 each and come with cleaning solution and cloth.

**Contact:** Inmac (UK) Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.



## Disk game

Audiogenic have released Aztec Challenge, a game for the CBM 64 involving warriors, human sacrifice and many ordeals in the ancient pyramid of Tenochtitlan.

There are seven levels and

graphics illustrate each level. It is available on disk for £12.95 and £8.95 for tape.

**Contact:** Audiogenic Ltd, PO Box 88, Reading, Berks. Or Tel: 01-290 6044.

## The Hulk

Incredible Hulk fans will be in for a treat this May when Adventure International launch a series of graphic adventure games featuring some of the Marvel characters. For the CBM 64, they will retail at £9.95.

The first one will feature the Incredible Hulk. The idea is that Marvel produces a comic to go with each game and the story line, left at a certain point is continued on the tape.

Adventure International of America have high hopes for the series as they think that a lot of home computer fans are also Marvel Comic fans.

**Contact:** 0244 313778.

## Launch

Mogul Software have launched several new arcade games for the CBM 64 and VIC 20. Titles such as Labyrinth of the Creator, Mushroom Alley, Cave Kooks, Ludwig's Lemon Razors, Chomper Man and Seawolf have graphic characters like mutants, robots and insects and are intended to be full of 'fast action'.

## On disk

Audiogenic have extended the Datagenic service of duplicating cassette based software to the business, technical and programming end of the market. They now duplicate disks as well as cassettes.

**Contact:** Audiogenic Ltd, PO Box 88, Reading, Berks. Tel: 0734 586334.

## Educate

The National Magazine Company famous for Harpers & Queen and She are moving into the software business under the guise of Ebury Software.

They have established a range of early learning educational software and titles like Mr T tells the Time and Mr T's Money Box. These will be available for the CBM 64 in June 84.

**Contact:** Ebury Software, National Magazine House, 72 Broadwick Street, London. Tel: 01 439 7144.

# Inside

Inside your computer, mounted on a printed circuit board known as the motherboard, are all the electronics for producing the specialised screen display, the sound producing circuits, the memory and all the logic needed to run the computer.

The computer's components are connected by copper tracks which connect the mounts into which the various chips are inserted. The numbers on the black and white photograph correspond to the numbers below. We explain the function of each item to give you an idea of how the computer is laid out and how it works.

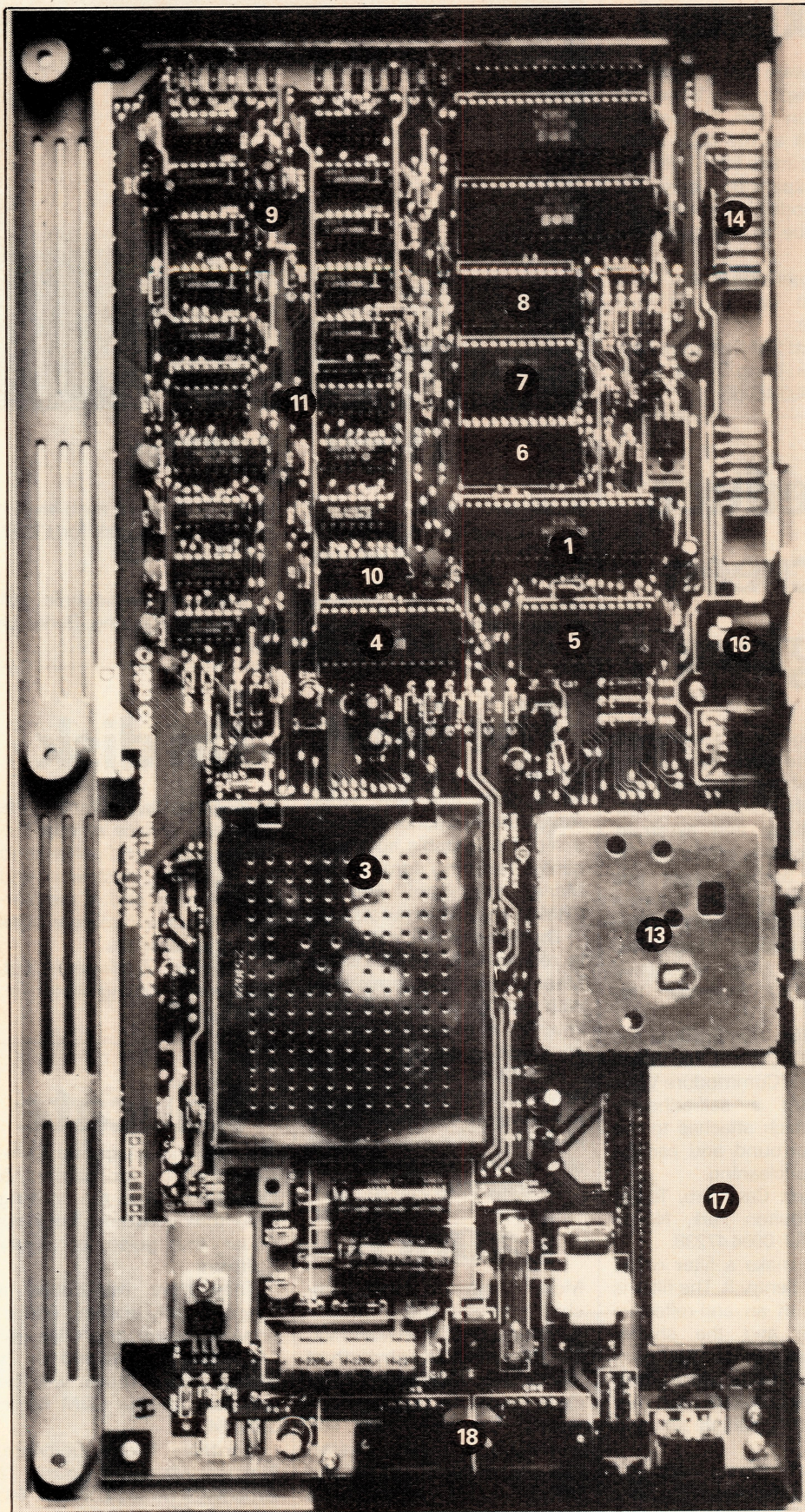
## ① 6510 microprocessor

The heart of any microcomputer is the Central Processing Unit (CPU). The 64 has the 6510 microprocessor chip, identical in internal architecture to the MOS Technology 6502 (found in the Vic-20) to provide software compatibility.

The CPU controls the entire board and consists of three interconnected sections, the registers, the arithmetic and logic unit (ALU) and the control section.

The registers are temporary storage units to store intermediate results, program instructions and memory addresses while they are being worked on by the microprocessor.

The ALU is the operational unit where calculations are performed and logical processes of selecting, sorting



# the 64

and comparing of information takes place.

The control unit co-ordinates the various internal actions of the micro-processor using the regular electrical pulses generated by the micro-processor's clock.

## ② 6526 Complex Interface Adapters (CIA's)

Under the control of the CIA's are the keyboard, joysticks, user port, cassette read to the user port and outer serial port (input and output to the disk, printer and other peripherals). They also control the shift register, two internal timers (read and write), the Time of Day Clock (TOD) and generate the interrupt system, telling the main processor to go to function elsewhere.

## ③ 6567 Video Interface Chip (VIC)

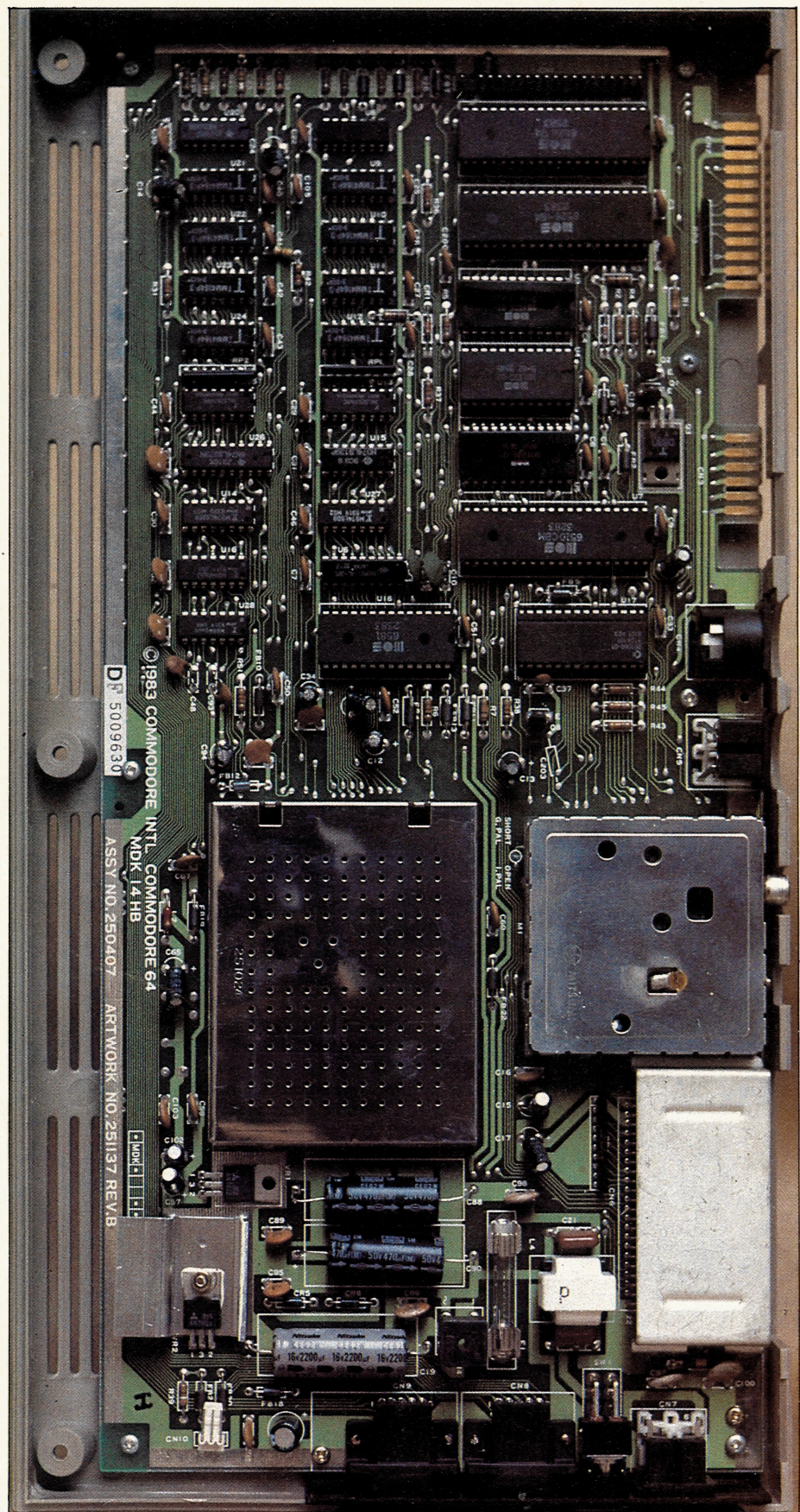
The VIC chip controls all output to the TV screen or monitor. It also controls sprites, a sprite being a high resolution programmable object used in sophisticated graphics which can be made into almost any shape and moved freely around the screen.

The VIC chip also produces an address bus similar to the processor. On occasions the VIC chip turns off the main processor and takes its place performing the video work. When this happens, the VIC chip generates addresses to the control system usually produced by the processor.

## ④ 6581 Sound Interface Device (SID)

SID is a single-chip, 3-voice electronic music synthesizer/sound effects generator providing wide-range, high-resolution control of frequency, harmonic content and volume. Each of its sound sources can produce four different waveforms, triangular, sawtooth, rectangular and white noise.

The frequency of each of the waveforms can be individually varied. Sound is then fed into an envelope shaper where the Sustain level and the



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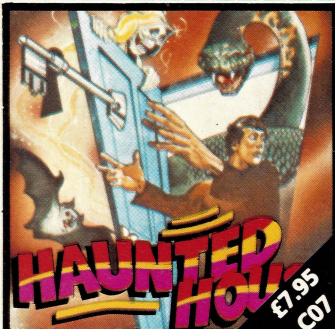
Test your skill on the Grand Prix track. Accelerating to breathless speeds can you overtake? Can you face the danger of night driving as the roads get narrower?

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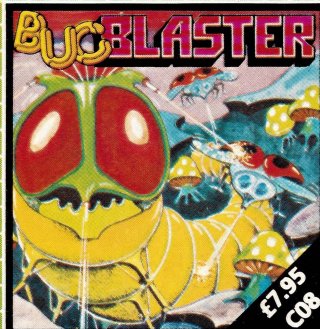
Fuel level low. Time running out. Collect fresh fuel to stay in the air or plunge to certain agonising death.

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\*payable to Superior Systems Ltd., 178 West Street, Sheffield S1 4ET.

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Alligata Software Ltd. 178 West Street,  
Sheffield S1 4ET. Tel: (0742) 755005

# INSIDE STORY

Attack, Decay and Release rates can be set up. The distinctive and simulated sounds of musical instruments are the result of this envelope shape. Apart from producing sound, SID has two analogue to digital converters for connecting games paddles which have two analogue to digital converters.

## ⑤ Programmable Logic Array (PLA)

This holds characters for memory AC's and decides which chip is being read from.

## ⑥ Character Generator ROM

Data for different characters is held by this chip. The 64 has 512 characters. Each character takes up 8 bytes, so this ROM is 4K in size.

## ⑦ Kernal ROM

Much of the machine code routine that controls input and output from the 64 is held in the Kernal ROM. This chip also holds the main routines for BASIC commands for program storage (load, store and verify).

## ⑧ BASIC ROM

All the BASIC commands are stored here. The chip performs all the routines of the BASIC interpreter, reading all the commands in BASIC and enabling the computer to act on them.

## ⑨ RAM chips

The Commodore 64 has, as the name implies, 64K bytes of RAM. It has eight RAM chips and each one selects one bit of a byte at any memory location.

## ⑩ Colour RAM

This stores the colour each character position is on the screen.

## ⑪ Non-inverted Tri-state Buffers

Buffers are areas of computer memory for temporary storage of either input or output data. These chips support and control the RAM chips to the address bus so that the chips switch tidily in and out without interrupting other operations.

## ⑫ Buses

The sections of the computer are connected by groups of electrical wires called buses. Inside the micro there are three buses:

### The address bus

In the 64 the address bus is 8 bits wide. It is bi-directional and carries memory addresses from the micro-processor to the memory (RAM and ROM).

### The control bus

This carries the signal to either 'read' or 'write' the memory location addressed.

### The data bus

This carries data back and forth between the CPU and the memory.

## ⑬ Modulator

The VIC chip produces a signal for a monitor and puts it on radio frequency. The modulator converts the signal produced by the VIC chip into a British TV compatible signal so that it can be displayed on a standard TV.

## ⑭ User port

This is an interface for non-standard devices and is used to send or receive signals under the control of the user's program.

## ⑮ Cassette port

The cassette motor and cassette switch sense are controlled by the cassette port.

## ⑯ Serial port

This controls standard peripherals such as a disk drive and printer.

## ⑰ Cartridge port

Sometimes referred to as the cartridge expansion port, this allows people to use software which does not have to be loaded into the computer.

## ⑱ Control ports 1 & 2

These control general accessories such as a light pen or a security dongle.

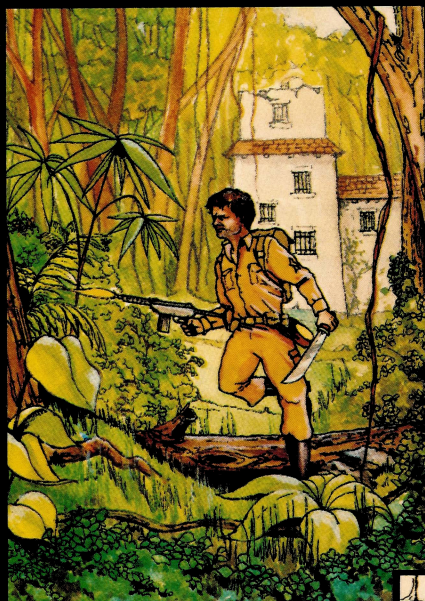


*A more familiar view of the CBM-64*

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CCI APR

## The cult of '84

**This month sees the beginning of a new series in Commodore Computing – Cult of the Programmer. In it we will be looking at top programmers from UK software companies – how they got where they are today and what their work involves. Here we talk to programmers from Virgin, Imagine, Galactic and Terminal, but first we look at programmers in general and provide some helpful tips for would-be programmers.**

To many sprite-eyed computer freaks, the life of a programmer seems like a dream come true. An opportunity to spend all day experimenting with your computer and actually getting paid for doing it, and making a veritable fortune at that! In reality, programmers are a hard-working breed dedicating hours to their work, often foregoing a social life – sometimes even food and sleep. And none of the programmers we have spoken to have hinted at untold wealth. However, it is a job that brings much satisfaction and no programmer begrudges the long hours.

If they are not millionaires yet, programmers have achieved the added bonus of becoming personalities in their own right.

Programmers like Jeff Minter of Llamasoft have almost become household names. His name on a game pack will guarantee good sales following the success of perhaps his most popular game, *Attack of the Mutant Camels*. While people don't believe that every game released by a software company will be of the same high standard, they can identify with an individual programmer's style of writing. If they like his way of thinking, they will probably enjoy his games.

Incidentally, if we constantly refer to programmers as being male it is because we have yet to discover a female programmer employed in writing games for a UK software company. So if you know differently please let us know.

Programmers are either employed on a full-time basis in which case they generally receive only a basic salary, or they are offered a contract to write games for a company. In this instance

they usually receive a lump-sum upfront and then royalties for each game sold. The day is probably not too far off when we will see transfer deals emerging, very much like the world of football, as companies try to poach top programmers.

Once a game is accepted by a company, the copyright becomes the company's property to exploit as they consider best.

Stories of young teenagers earning small fortunes from programming games have encouraged parents to push their offspring in that direction. Parental pride blinds many to the fact that although they think little Johnnie is the best thing since sliced bread, his games are probably not up to a commercially acceptable standard.

Software companies receive prospective games from young hopefuls by the sackful. Only a few make it. So how easy is it to become a successful programmer? We asked top programmers for their advice.

One fact that emerged is that it is not considered necessary to have a computer background based on study. The general opinion is that it is better to learn on your computer than from books or lectures.

As to what makes a game successful, Galactic programmer Richard Darling (only 16 himself) advises: "In order to be successful a game should be graphically pleasant. It must be fun to play and have a lasting interest. More than one level is essential to make a person want to carry one playing.

"Sound effects are also important," continues Richard. "Try to come up with music that people will remember."

Imagine programmer, Mike Glover,

confirms this and adds that up-and-coming programmers must learn and be proficient in machine code. Mike also suggests that if a programmer wants to have his work accepted by a software company, he should produce a program to demonstrate his talents. "Even a series of good routines would do the trick," says Mike.

Dedication to your program is essential. A criticism of many games is that a good idea is not followed up by attention to detail. Many programmers spend almost as long as it took them to write the game in tidying it up. What would happen if the craft spiralled to the ground when hit instead of plummeting straight down? Can the graphics be improved? Are there any bugs still in the program? Once a program is completely satisfactory, by all means approach the software companies.

Virgin Games' managing director, Nick Alexander, reveals what a software company looks for in a potentially marketable game. "Graphics are extremely important," he says. "Unless a game has immediate visual appeal it is ignored. Next comes the playability factor – whether when you finish playing a game you want to have another go. And finally it has to be different to other games already on the market. There's no mileage for us in putting out an identical game."

It looks as if the computer games market will be with us for some years yet, so we can expect the emergence of many more top programmers. In the words of Virgin programmer, Steve Lee: "If you are dedicated and stick at a game, there is no reason why you can't come up with something really good".

# PROGRAMMERS



## Steve Lee – Virgin

Steve Lee studied Computer Science at college and became an experienced computer operator before becoming a programmer for Virgin Games a year ago. He readily concedes that at the ripe old age of 25 he might be considered 'over the hill' by some of the teenage computing prodigies, but says: "There's a few years work left in me yet."

Becoming a programmer was always Steve's ambition. His first computer, a ZX81, was quickly replaced with a VIC-20 and then a 64. In his spare time he programmed several games which were

marketed by Quicksilver. He was then taken up by Virgin Games who included Steve's Mission Mercury in their launch package.

Working from home on his 64, Steve finds himself working for up to 16 hours a day. "When I've got a good idea I spend hours working on it," he says. "Ideas suddenly come to me. I usually start with an idea for the graphics and take it from there. I always thought ants would make nice graphics and that's where the idea for Hideous Bill came from. Hopefully I will write a game with

skeletons in soon."

When stuck for an idea, Steve heads off to the pub, preferably one without a games machine. "I've never been keen on video games," says Steve. "I have only ever been interested in programming them."

With experience Steve finds it is taking less time to program a new game. He explains: "With Falcon Patrol I had the ideas but it took about five months to complete. Now I've built up a stock of routines it takes less time."

Being a perfectionist where his games are concerned, Steve spends as long as it took to write the game in tidying it up and seeing if it can be improved. "Learning how to get an effect from the machine is great fun," Steve comments. "We've taken the 64 as far as it will go, although I'm sure that more can be done with the SID chip."

Like many programmers, once a game is completed Steve will never play it again. "I don't even ring Virgin to see how well it is selling," he says.

Not wishing to put all his eggs in the same basket, Steve is already considering other outlets for his programming talents. He recently programmed a sequence for a new Virgin film due for general release in the summer. Called Electric Dreams, it concerns a computer who falls in love with the woman upstairs and its subsequent battles with its user for her affections.

Steve also has plans to investigate computer graphics as a form of advertising in the future.

Poor Reg Stevens was laid up with a broken arm when he spoke to Commodore Computing. He insisted it was the result of a roller-skating accident, but rumour has it he forgot his parachute in Super Dogfight!

Super Dogfight is just one of the many games Reg has written for Terminal, others including Skramble, Get Lost and new release Star Commando. At 41, he admits to being "almost geriatric by games programmers standards".

Programming games is a part-time job for Reg. During the day he works as an electronic engineer, coming home to spend about 20 hours a week on his computer. Although Reg has previous experience of programming, "I dabbled in Assembly language," his VIC was originally bought as a 'play thing'.

The association with Terminal came about when Reg gave a friend (who happened to work for the company) one of his games for his own personal

entertainment. Terminal decided to market it and now Reg writes many programs for the company.

"I work most days on my games," says Reg. "Once I start I have to keep going. After a two day gap I have a



## Reg Stevens – Terminal

problem getting back to it. It's difficult to remember where you left off."

Ideas for new games are no problem for Reg. Quite the opposite. "My problem is that I find it difficult to finish one game before I come up with an idea for a new one," he says. "I find myself chopping and changing between games all the time."

Working part time on his games, it takes Reg about three months to complete each one. "These days games are getting more sophisticated," says Reg. "At the moment we are going through a phase when graphics are very important, sometimes to the expense of the quality of the game. It's important to combine good graphics with a good game."

Reg finds that the best critics of his games are his two sons, aged 11 and 14. He comments: "I started to write the games for my sons. They now tell me where I'm going wrong! My 14-year-old is already showing signs of taking over."

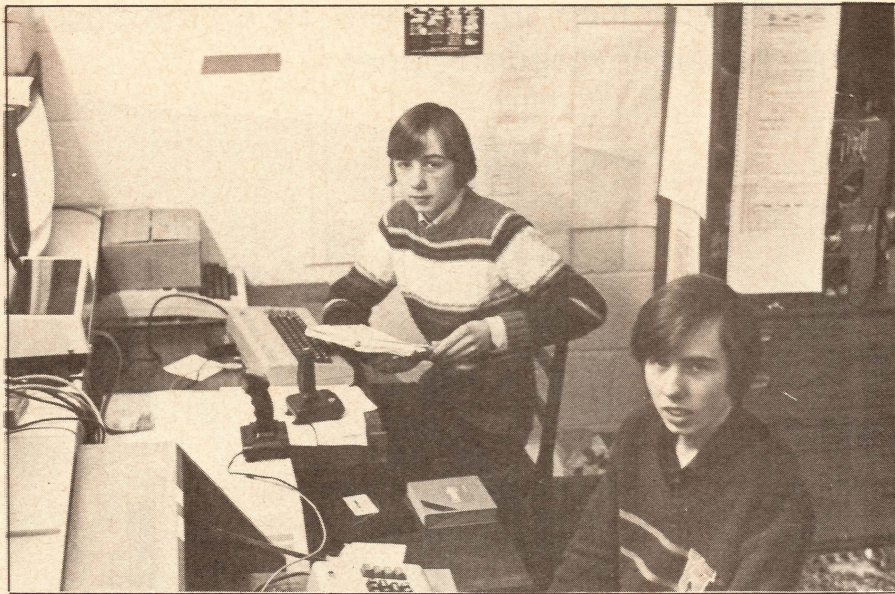
# PROGRAMMERS

At the age of 16, Richard Darling is one of those computer whizz-kids making his mark in the computer programming world. For Richard, programming became a hobby when he acquired a VIC-20 and he was soon spending hours after school experimenting with programs together with his brother David, now 17. The two decided that their games were as good as, if not better than, any on the market. A classified ad placed in a computer magazine brought overwhelming response and so the Darling brothers formed their own software company, Galactic, just over a year ago.

Now programming is a full-time job for Richard. "We get to work at 9am, stay until 7pm when we break for dinner, then come back at 9pm and work until midnight or later," says Richard. "And that's usually seven days a week!"

That's dedication. Despite the long hours, Richard still enjoys what he is doing and is never stuck for ideas. Usually the brothers sit down and discuss thoughts for new games, but there are occasions when an idea suddenly springs to mind. For a long time Richard had been puzzling over the possibility of a 3D maze game without using machine code. "One morning I woke up with the solution, so I leapt out of bed and tried it. It worked."

Richard explains that when they first start programming a game, they have only an idea to work on and that during writing the program more ideas occur and so the game progresses. The time



*Richard and David Darling at work*

## Richard Darling – Galactic

taken to write a program varies according to content. Richard comments: "Something like our Games Designer for the 64 takes about four months. In doing the games designer we built up routines which we can use again. Now we can program a three-level game at the rate of one level a day."

Once a game is complete Richard does not play it again which comes as a surprise seeing as his father used to bemoan the time and money Richard spent at amusement arcades. Richard confirms this: "There aren't any amusement arcades where we are now living,

but if there were I would still go. The more you look at arcade games you get a better understanding of what people want from a game."

Examples of the games the Darling brothers have written for Commodore computers include Orbitron, Sub Hunt, Bunny Zap and Bug Diver.

Looking to the future, Richard says they will continue producing games to meet public taste. "We'll be doing the sort of programs that people want like arcade games and designers, but fairly soon we will do some more serious programs such as educational."

Mike Glover, 26, wrote the game Pedro for the 64. He learnt Basic programming as a subsidiary subject at college, but like many programmers his VIC-20 was just a hobby. Mike came into contact with Imagine when the software company sponsored Palamini, the company he was then designing racing engines for. Computers cropped up in the conversation and Mike was offered a job as a programmer for Imagine.

Imagine employ an artist to draw the graphics and somebody else to write the accompanying music. It is then Mike's job to write the program.

"Ideas for games come from various people," says Mike. "Pedro was actually based on an idea we received in a competition we held. Once the idea's there, it takes a couple of months to write the program. Depending on how rushed we are to meet a deadline, that sometimes means sitting up for 24 hours a day. It's fun though so I don't mind."



**Mike Glover – Imagine**

Mike generally teams up with another programmer and they are now working on a new game. Without giving anything away, Mike says it is a totally original arcade game with a touch of adventure graphics and add that it will be a long game.

It was Mike who programmed the fast tape load, Injector-load, used by Imagine in their games. Mike comments: "It runs a whole new cassette operating system and loads a program in just three and a half minutes. It flashes the border colour and gives the effect of speed by appearing to scroll down the screen."

In future games, Imagine will add music while the program is loading and a loading screen.

Mike has never been a keen games player. "I have never bought a computer game," he says. "There's far more fun in writing games than in playing them. You've got to be young with fast reactions – Pac-Man is about my limit!"

# STARTING NEXT MONTH

A regular free supplement to Commodore Computing International magazine devoted to games.



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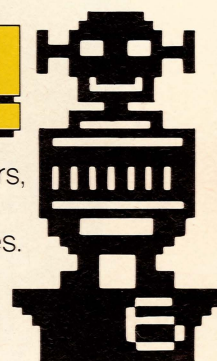
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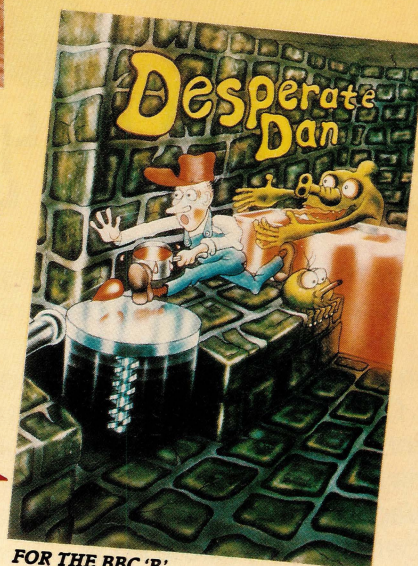
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# Transylvanian twist

**Characters such as Count Kreepie and Quasimodo feature in this month's selection of new games for the VIC-20 and the CBM-64 designed to test your brain power as well as your reflexes.**

## Hunchback

Hunchback takes the player back to the days of old when knights were bold and computers hadn't been invented.

The hero of this game is a sprite called Quasimodo and his task is to hop along the ramparts of the castle and rescue the trapped Esmerelda. This is no mean feat because the hunchback has to avoid all the knights, fireballs, arrows and fiery pits.

The initial screen is quite ingenious showing Quasimodo happily skipping along to the tune of The Teddy Bear's Picnic whilst also giving details of some of the hazards that the player will have to overcome.

In all, there are 15 different screens, each one being more difficult than the last.

**Title:** Hunchback

**Company:** Ocean Software Limited, Ralli Building, Stanley Street, Manchester M3 5FD. Telephone 061 832 7049

**Type:** Arcade

**Graphics:** Very good

**Hardware required:** 64, monitor, joystick (optional) and cassette recorder

**Price:** £6.90

**CCI rating:** \*\*\*

At the start of the game, the player has to find his way up from the dungeons and is helped by the provision of a floor plan. Later on, such a plan can only be accessed after a bat has been killed. Apart from the Count himself, these bats are the only real danger and practically the only difference between levels three and four and level two, apart from the new maze generated for each level, is that the bats must be shot through the heart.

Level five is where the fun really starts because out of all the devices that the player has picked up and dropped on the way, only one is capable of killing the Count.

The tower itself has 500 different rooms with the player getting around using the unshifted cursor keys and the arrow keys.

**Title:** Transylvanian Tower

**Company:** Richard Shepherd Software, Elm House, 23/25 Elmshott Lane, Crippenham, Slough, Berkshire. Telephone 06286 63531

**Type:** Adventure

**Graphics:** Good

**Hardware required:** 64, monitor, cassette recorder

**Price:** £6.50

**CCI rating:** \*\*\*

The first game is called Orbits and the player has to fit various shapes dropped from a spacecraft and fit them into the appropriately shaped landing areas.

This game is followed by Knights Move which is a little more intellectually stimulating. Here, a grid of squares has to be filled without landing on the same square more than once. This is followed by Graphic Twister where the player has to manoeuvre some graphic displays around to match a pre-set pattern.

On the other side of the tape are the remaining three games. Rainbows is not, as the title suggest, about the British weather. Instead it is about working out a series of mathematical patterns. For example, the screen display shows A, B and D and the player has to work out the next letter. This is probably the best, game of the lot for its use of colour, because with each correct answer a rainbow is constructed.

This is followed by Slide Puzzles which is another game where the user has to create a pattern and finally Digits where the sole aim is to plot a path through a series of numbers and get the highest score.

At the end of each game the user is not immediately allowed access to the following game as each game has to be loaded separately. This is only a matter of seconds and is therefore not too much of a disadvantage.

**Title:** Puzzle Pack

**Company:** Sumlock Electronic Services, Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233

**Type:** Arcade compilation

**Graphics:** Poor

**Hardware required:** VIC or 64, cassette recorder, monitor

**Price:** £6.95 for the VIC version and £7.95 for the 64 version

**CCI rating:** \*\*

## Transylvanian Tower

Dracula's cousin, Count Kreepie, comes to life in a game called Transylvanian Tower. This is an adventure game for the 64 where the player has to find the Count, kill him and grab the hidden treasure. As usual with this sort of game, it is not as easy as it sounds. There are five levels to the game and the player will not come across Count Kreepie until the last level.

## Puzzle Pack

Puzzle Pack is one of those cassettes that contain more than one program on both sides of the cassette. The programs are often of a dubious quality and this collection is no exception.

This compilation has six programs, three on each side. As with most tapes of this sort, only a couple are any good, the rest being average or worse.

# KICK~OFF

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**New**

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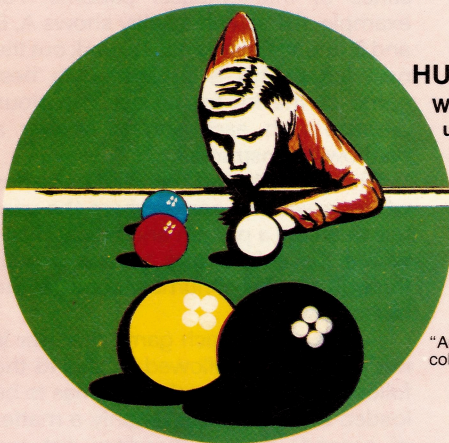
Similar to our 'Best Seller' Exterminator, but this game fires back! Obliterate all of the Widows Warriors but watch out for Photon Webbs and devious Egg Layers. Machine code.



## HUSTLER

Written in machine code and using Sprite graphics HUSTLER takes the 64 to its limits. There are six 'pool' type games for one or two players, high scores kept and super music. Machine code. See the great press reviews. You won't find a more realistic snooker type game.

"Another gem - a must for the collection"  
Commodore Computing



## EXTERMINATOR

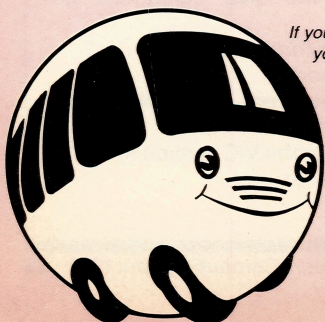
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## Marathon

As the title suggests, Marathon is all about racing. Racing against time and the opponent. It is also an educational piece of software designed to run on the 64.

The screen is split in two with the lower half comprising two grids of numbers which form the selection of possible answers to questions. The selection of an answer, whether it is wrong or correct, prompts action in the top half of the screen. Here, there are two runners and the more correct answers that are entered, the greater distance the runners will cover.

The questions themselves cover the four mathematical areas of addition, multiplication, subtraction and division. There are several skill levels and as the player progresses, the time allowed to answer each question becomes shorter.

Although this is an original educational idea and the screen is very colourful, for some reason the game did not respond all that easily to the joystick.

**Title:** Marathon

**Company:** English Software, Box 43, Manchester M60 3AD. Telephone 061 835 1358

**Type:** Educational

**Hardware required:** 64, monitor, joystick, cassette recorder

**Price:** £9.95

**CCL rating:** \*\*\*

## Nightmare Park

Nightmare Park is a strange mixture of an adventure-cum-arcade game for the 64 from A.R. Software.

The player starts off at the entrance to the park which is graphically portrayed as a maze. The object is to get to the park exit without losing the six lives. As the player progresses through the park, he is confronted by several hazards each of which may cause the player to lose a life. There are various hazards depending on the path chosen and the level of play.

In all there are 14 levels of play. Level 1 seems to consist solely of stampeding herds of cattle, whereas on other levels the player will encounter swarms of stingers, a mad mathematician, a starving lion, a vicious gorilla and the occasional abyss.

Although the graphics leave a little to be desired – the stampeding herd is actually the sign for Pi on the VIC and the 64 – the sound effects are very good.

Once the player reaches the park exit, he can increase his score by progressing

onto the next level of play. The game, which comes on a cassette, is controlled by the keyboard or joystick.

**Title:** Nightmare Park

**Company:** A.R. Software, 86 Avonbrae Crescent, Hamilton ML3 7PJ, Strathclyde, Scotland

**Type:** Arcade/adventure

**Graphics:** Good

**Hardware required:** 64, monitor, cassette recorder, joystick optional

**Price:** £7.99

**CCL rating:** \*\*\*\*



## Jumpin' Jack

Many original and successful games have generated their own entourage of copy cat games. Frogger is no exception and has just acquired another version of the original game. This time it is called Jumpin Jack and comes from Livewire Software.

The aim of the game is the same as in the original – hop across the road without getting squashed and navigate the river – with the addition of a few frills. For instance, not only are points awarded for rescuing Jill, the female frog, but they are also awarded for eating the dragonfly in the frogs home bay. As well as the dangers posed by the vehicles, which increase in speed and quantity as the game progresses, there are crocodiles, snakes, turtles and otters to be avoided.

Another frill concerns the graphics, which are three dimensional. Whilst this

is no doubt a great selling point of the game, it is also slightly disadvantageous because as the game is viewed from a three dimensional perspective it is slightly difficult to see whether Jack has reached the other side of the road safely or not.

It is possible to control the game using the keyboard or the joystick and, if using the keyboard, the player may re-define the standard set of playing keys according to personal preference.

**Title:** Jumpin' Jack

**Company:** Live Wire Software, Sumlock Manchester, 198 Deansgate, Manchester M3 3NE. Telephone 061 834 4233

**Type:** Arcade

**Graphics:** Good

**Hardware required:** 64, monitor, cassette recorder, joystick optional

**Price:** £8.95

**CCL rating:** \*\*\*\*

## Gridtrap

Gridtrap is a new game for the 64 where the player really does get the boot. It is either that or being blown up. These are the fates that await the player in this new game from Sumlock Microware which forms part of the recently launched Live Wire series. The sole aim is to get as many points as possible by collecting flags and defusing bombs.

So far, the game sounds quite ordinary but it isn't. There is a mixture of high resolution and sprite graphics, Mr Live Wire being a bit of multi-coloured hi-res.

There are several other attractive features to this game, the most important ones being the nine skill levels and the user definable operating keys. This latter feature is very useful if the game is being played from the keyboard although some keys are reserved for other functions. For instance the game can be paused using P, the demonstration screens viewed using V and the melody that accompanies the game can be turned off.

**Title:** Gridtrap

**Company:** Livewire Software Ltd., Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233

**Type:** Arcade

**Graphics:** Excellent

**Hardware required:** 64, cassette recorder, joystick optional, monitor

**Price:** £8.95

**CCL rating:** \*\*\*\*\*

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## Space Escort

Romik have recently produced some very good games for the 64, most notably Zappy Zooks and Stellar Triumph. By contrast, and taking into account the limitations of the VIC when compared with the 64, Space Escort is disappointing.

As with all games for the VIC, Space Escort comes on cassette and the player is given no less than 26 liners to escort to the newly conquered planet of Sistoria. The journey of the liners is fraught with danger as there are the compulsory hordes of attacking aliens whose sole aim is to destroy the liners and their escorts. This is something they are often successful at doing.

Each liner has several shields, with the colour of the liner denoting how many shields are left. The player starts off with nine escorts with a bonus of four more being awarded on reaching the planet. Once a liner has arrived safely, 8000 points are awarded to the player and the player is advanced on to the next skill level.

The space background is rather boring, but the game, which is controlled either by joystick or keyboard, has several useful features. It is possible to restart a game at any time and freeze the action.

**Title:** Space Escort

**Programmer:** Darren Hall

**Company:** Romik Software Limited, 272 Argyll Avenue, Slough, Berkshire. Telephone 0753 71535

**Type:** Arcade

**Graphics:** Average

**Hardware required:** VIC, cassette recorder, monitor, joystick optional

**Price:** £5.99

**CCI rating:** \*\*\*

## Triad

Another shoot-the-aliens type arcade game, this one being a strange mix of Galaxians and Space Invaders.

The aliens in Triad initially move across the screen like those in Space Invaders and then swoop down in Galaxian style dropping bombs on the players base. The player, of course, has to destroy the aliens and this is a little bit slow because the laser cannon will not fire again until the first shot has exploded.

The fleet of aliens is made up of several different craft worth different amounts of points. As soon as the dive bombing begins, the points score doubles. Once a fleet of aliens has been destroyed, another appears and each time the action gets much more frantic.

The high resolution graphics are quite good and the sound effects are interesting if not outstanding.

**Title:** Triad

**Company:** Sumlock Electronic Services, Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233

**Type:** Adventure

**Graphics:** Good

**Hardware required:** VIC, cassette recorder, monitor, joystick optional

**Price:** £7.95

**CCI rating:** \*\*\*



## Insector

Eating humanoids is not a very nice activity but that is exactly what the aliens do in a game called Insector which is written for the VIC and comes from Romik. Like Skramble, this game also uses up only half of the television screen. What is worse is that, horizontally, the game scene runs off the edges of the television screen.

The aim of the game is simple – destroy the aliens before they eat the humanoids. This is not as easy as it sounds because eventually the whole screen is filled with green and purple aliens, white dots that turn out to be

bombs and dozens of insects which cannot be destroyed.

As the commander of the surface patrol fleet, the player sends in six ships one at a time to protect the humanoids. Occasionally a bonus level is awarded for surviving with one craft for a period of time, but this is very rare. Even when this does happen, the advantage is offset by the appearance of an extra insect.

Not all games for the VIC make use of the function keys and it is to its credit that this one does. It is possible to freeze the action at any point and to increase and decrease the skill level.

**Title:** Insector

**Company:** Romik Software Limited, 272 Argyll Avenue, Slough, Berkshire. Telephone 0753 71535

**Type:** Arcade

**Graphics:** Average

**Hardware required:** VIC, cassette recorder, monitor, joystick

**Price:** £5.99

**CCI rating:** \*\*

## Pottit

Question: What do you get when you cross a game of snooker with a game of pool? Answer: A brilliantly simple game called Pottit. The screen background to this game is a pool table but that is where the similarity ends. The game (which must be played by two players) consists of three balls, two of which are controlled by the players.

The rules of the game are quite simple although it does take a little time to get used to them. Basically, hitting or potting the opponents ball or the third ball will score points and the first player to score 50 points wins the game.

However, it is more than just a case of charging round the table trying to score points. The player has to be a master tactician. Controlled by joystick, this is one of those games where the players wish that the joysticks could be bent to give greater control of the cue balls, but the inability to do so only adds to the fun of playing this game.

**Title:** Pottit

**Company:** Romik Software Ltd., 272 Argyll Avenue, Slough, Berkshire. Telephone: 0753 71535

**Type:** Simulation

**Graphics:** Average

**Hardware required:** 64, monitor, cassette recorder, two joysticks

**Price:** £6.99

**CCI rating:** \*\*\*

# GAMES

## Neptune's Daughter

Neptune's Daughter is an arcade game for the 64 set underwater which incorporates doing battle with evil sea serpents, gigantic crabs, an octopus and several plants which have the nasty habit of sucking the diver down to his death.

The player must go through all this before Neptune's Daughter can be rescued and led back to the safety of the palace.

The basic screen display is very much like that used for games like Skramble – a long, narrow 'tunnel' of rough terrain inhabited by the sea creatures. At the start of this game, the player is given five lives. One extra life is awarded for the rescue of each maiden (a maximum of nine lives is possible) and points are awarded for destroying practically everything as well as collecting oxygen and feeding the crabs to the serpent.

**Title:** Neptune's Daughters

**Company:** English Software, Box 43, Manchester M60 3AD. Telephone 061 8351358

**Type:** Arcade

**Graphics:** Good

**Hardware required:** 64, joystick, monitor, cassette recorder

**Price:** £9.95

**CCI rating:** \*\*\*

## Starship Escape

Not many adventure games have been produced to run on the VIC and those that have quickly go to that great games machine in the sky. Starship Escape could be the exception.

This space adventure takes place in a gigantic alien spaceship, the parts of the player's spaceship being randomly distributed in several rooms. In order to escape from the alien ship the player has to assemble the spaceship by collecting the parts most of which are guarded by the aliens who come in the form of spiders, robots and androids. In this perilous task, the player is not alone. A man's best friend is his dog and in this case K9 is the companion.

The 16K needed to run the game is very well used. Graphically the game is well above average and the colours are quite outstanding for the VIC.

The control of this adventure game is either by joystick or keyboard, the joystick being the easiest method.

Starship Escape is a space adventure game which supports the manufacturers claim that it is compelling and exciting.

**Title:** Starship Escape

**Company:** Sumlock Electronic Services, Royal London House, 198 Deansgate, Manchester, M3 3NE. Telephone 061 8344233

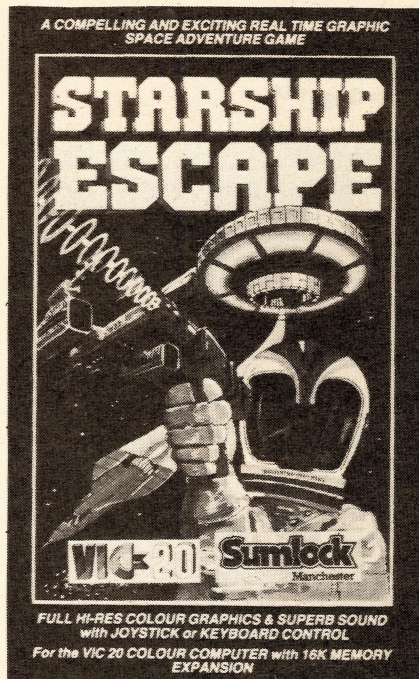
**Type:** Adventure

**Graphics:** Excellent

**Hardware required:** VIC, 16K expansion, cassette recorder, monitor, joystick optional

**Price:** £9.95

**CCI rating:** \*\*\*\*\*



## Skramble

Written in 6502 machine code, the aim of Skramble is to pilot a craft through the enemy underground installations. The player is equipped with bombs and fire power, the bombs being activated by pressing the space bar. However, it is very difficult to control the craft, fire at the enemy and drop the bombs at the same time. It is also disappointing to note that only half the television screen is used.

At the top of the game screen there is a fuel indicator which is replenished everything enemy fuel tanks are destroyed and points score. Points are awarded according to what is destroyed and how many miles of terrain is covered.

At the start of the game, the player is awarded three lives and has to pass through three phases of the game. The constant attack from ground launched missiles is accompanied by storms of fireballs which cannot be destroyed. Both of these hazards increase in number and speed as the game progresses.

**Title:** Skramble

**Company:** Sumlock Electronic Services Limited, Royal London House, 198 Deansgate, Manchester M3 3NE. Telephone 061 8344233

**Type:** Arcade

**Graphics:** Good

**Hardware required:** VIC or 64, cassette recorder, monitor, joystick optional

**Price:** £7.95 for the VIC version and £8.95 for the 64 version

**CCI rating:** \*\*\*

## Dots and Boxes

Dots and Boxes, or Squares as the game is sometimes called, used to be played on a sheet of paper with lots of little pen marks forming the boundaries of the game. A computerised version of that game is now available for the 64.

The basic screen layout is an adequate but uninteresting grid of dots that are identified by letters. The aim of the game is to get as many boxes as possible by tactically forcing the opponent into a situation where the only way out is to draw the third side of the box leaving the other player to complete the design.

In this cassette based version, which has the same program on both sides of the cassette, the pen is replaced by the joystick or the keyboard. If the joystick is being used all the player has to do is move along to the required square and 'draw' a line by pressing the fire button. Using the keyboard it is necessary to specify the square by typing in the letter. At the start of the game it is simply a matter of drawing the line anywhere within the grid. As the game proceeds, the player has to think much harder about where to put the next line.

**Title:** Dots and Boxes

**Company:** A.R. Software, 86 Avonbrae Crescent, Hamilton ML3 7PJ, Strathclyde, Scotland

**Type:** Simulation

**Graphics:** Good

**Hardware required:** 64, monitor, cassette recorder, joystick optional

**Price:** £6.95

**CCI rating:** \*\*\*

# Computerama

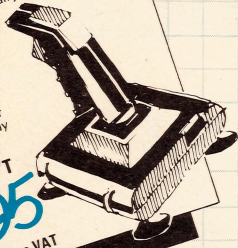
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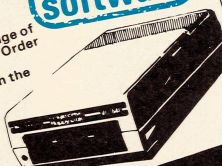


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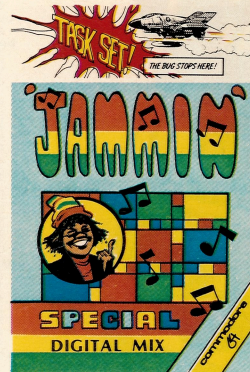
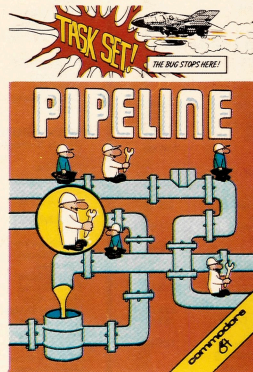


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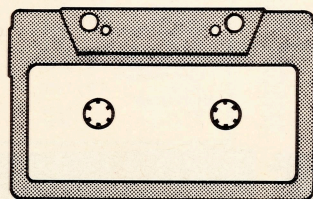
Naturally, everything we've written for the 64 is available on either cassette or disk.

Selected titles available from: W H Smith, Boots, Menzies and all good computer stores.

Major distributors include Microdealer UK, Websters, Centresoft and P.C.S.

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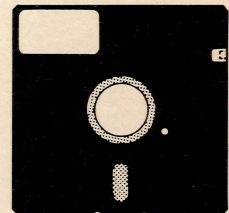
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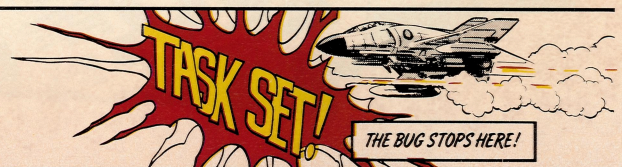
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# Programmers friend

**Three software programs are featured this month: Dynatech's Codewriter which enables self-generation of programs; Whitby Computer's Softchip, offering the user a choice of commands; and Elmhirst's editor/assembler.**

During the past two and a half years Whitby Computers Ltd have been developing and selling various tools and utilities, usually on a cartridge, for Commodore computers. Now they have a new service available for 64 users. The company is marketing 8K custom made cartridges containing the user's choice of commands.

Softchip 64 Programmers Friend and Softchip 64 Business Command Cartridges are standard cartridges which demonstrate the facilities available to customers. These cartridges give the 64 user more control over his machine and are very versatile and useful in themselves. But the most interesting aspect of the service offered by Whitby Computers is the custom made cartridge.

For £35.00 there's a choice of commands. Since the cartridge is 8K it is obvious that it would be possible to have 10 or 12 really powerful commands or many smaller less powerful commands. After making the initial purchase there is a follow up service available. Expansion discs or tapes are available as the user develops his interest.

Both cartridges will work with peripherals on the Commodore serial bus although an IEEE adaptor would be required when using the 4040 and 8050 disk drives.

The commands available in the Softchip range are all the disk commands which Commodore incorporated in the Basic 4 computers but omitted in the CBM 64. However there are restrictions – the 3040 will not recognise the APPEND and RECORD commands and the 1541 will not recognise the APPEND command.

Each command is called up, as usual, by using a keyword – SCRATCH, for instance, deletes a file from the disk. These Softchip commands have a rigid syntax which the 64 understands. If the syntax is wrong the usual syntax error message will appear and a similar message appears for incorrect values. Every Softchip command can be entered in an abbreviated form.

The commands can be entered in either the program mode or the direct mode. Not all the commands can be used in both modes but if one is used in the wrong mode, Softchip will ignore the instruction and carry on to the next. A problem we discovered here is that the user will then have to wait until the end of the program to discover any illegal data which may have been entered.

There are some commands that can be used in either mode. In direct mode, for instance, the disk load command would load the new program, clear the variables and wait for the next command, while in program mode the new program is loaded and the program starts running without having to clear the variables from any previous program.

Future commands will deal with hi-resolution graphics, music, sound

effects and an auto start facility. The expansion tape packs will be marketed at a cost of £1 per. 400 extra bytes required, for disk versions an extra £3 must be added.

**Name:** Softchip 64

**Company:** Whitby Computers Ltd, 8 Chubb Hill Road, Whitby, North Yorkshire YO21 1JU. Tel: 0947 604966/8

**Product:** Programmer utility  
**Applications:** Programming and business

**Documentation:** A good manual

**Minimum hardware:** CBM 64, printer and disk drive

**Price:** £35.00 per softchip

**Comments:** Almost unlimited uses and good value for money.

## Your generation

CodeWriter, from Dynatech Microsoftware, is a program generator which allows the user to self-generate programs to suit individual requirements. It runs on the 64 and the 8000 series with a 1541 disk drive ideally, although a 4040 or an upgraded 1540 are acceptable.

With CodeWriter the user concentrates on the structure and control of information rather than the actual programming. The design of the program and control of information is regulated by a series of menus, the first of which is the main menu system. After formatting the disk, the screen on which information is to be entered is created.

This is flexible as it is possible to type anywhere on the screen.

Up to 100 fields of information can be fitted onto one screen, a field being one specific piece of information such as the name of a customer.

Customer records should provide prompts for further information like the amount owed and the customer's address. When entering a prompt it is important that the prompt does not contain any dots as Codewriter will search for the dot and assume that the dot is the response. For example, when entering a question which requires a one character response as in 'max. amount

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payable?', CodeWriter will assume that the dot following the abbreviation is the response and that 'amount payable?' is a second prompt. Dots may be entered after a prompt to indicate how much space is available for the response.

In order to edit the initial screen format, it is necessary to alter the position of the information in the memory using the change screen format option. Once the initial screen format is satisfactory, data is entered into memory by hitting the escape key.

After a few seconds the screen returns and the user then defines whether the operator or CodeWriter calculates the response. Where the prompt concerns numeric data, it is far quicker to generate a CodeWriter response.

CodeWriter calculates addition, subtraction, division and multiplication.

Brackets can be used to isolate components in formulae.

A reference field can be created which allows the user to hold a previous value while calculating a new one. Whenever CodeWriter sees a calculation with the same program calculation number on both sides of the calculation, a special file for reference fields is automatically created. A similar operation can be performed with keyboard entered fields using the update data option.

User-defined error messages can be entered using everyday language so that the relevant message appears at the appropriate stage. Once the program format is complete, the user converts the program into BASIC. This automatic conversion is performed by pressing return when the correct date format is entered.

The CodeWriter disk should be removed when the computer prompts the user to do so, and replaced with the formatted disk. The program will then be saved onto disk.

**Name:** CodeWriter

**Company:** Dynatech Microsoftware, Summerfield House, Vale, Guernsey, Channel Islands. Telephone 0481 20155

**Product:** Program generator

**Application:** Record management

**Documentation:** Good manual and demonstration disk

**Minimum Hardware:** 64 or 8000 series; 1541, 4040 or 1540 disk drive; compatible printer

**Price:** £85

## The assembly line

Elmhirst Enterprises' assembler, Osiris, and its companion text editing program, Freditor, are designed for use with the Vic-20 and the 64. They are not intended for the novice.

Available on tape or disk, the assembler is written in 6502 machine code and enables the user to create programs in machine code using symbols for instructions and data.

If used with the 64, a minimum 8K expansion is required and a 1540 or 1541 disk drive. A larger amount of expansion will give greater flexibility.

Use of the editor, which eventually produces the source file, is required in the first stages assembly. Like most editors, Freditor has a scroll feature. More than 230 characters can be entered onto each line using scroll to the right. Full use of the function keys is made so scrolling is not confined to a horizontal direction. A full page may be moved backward or forward.

The area in which text is entered is automatically adjusted as additional text area is added. It is possible to save, move, delete and duplicate areas of text to other areas of the file. This editor uses the standard mnemonics for the 6502 as well as the symbolic features of Osiris. Commands to the editor are given when it is in the menu mode. Commands are single key operations and the main

menu can be viewed at any time without losing or altering text.

Once the source file has been created and is ready for assembly, the program can be left in memory to be recalled by one of the Osiris options, or saved.

On printing out text it is necessary to specify if a parallel or serial printer is being used. A parallel printer prints out quicker, but the user will need an interface cable with a 36 pin d-type connector on one end and a 24 pin card-edge connector on the other.

Two sorts of printouts can be obtained. A listing gives a complete record of the program and an object file is in a form which can be converted to executable code called the object code.

After completion of the source file, assembly can begin. If tape is used, it is not possible to read and write at the same time and the manufacturers suggest that the user should load the program from tape to memory using the F7 key and assemble the file using the memory option for the source file.

After the hex file has been loaded into the memory, it may be executed by entering the start and end address of the memory along with the filename.

The source file is assembled in two phases, the first phase evaluating the program statements, incrementing the programs counter and building up a

symbol/value table. The second phase supplies the symbols and values which are obtained from the symbol table, and generate the object code.

The object code is generated in a sequential file in the form of intel hex where the information is stored as a sequence of ASCII characters that form a record.

The complete file generated in the form of intel hex is a series of records initiated by the colon. The records that follow should include the number of bytes of data per record as well as the start address of the data and hexadecimal data, some form of checking all the data following the colon and a means of displaying the information/results.

**Title:** Osiris and Freditor

**Company:** Elmhirst Enterprises, 99 Porchester Road, Hucclecote, Gloucester. Telephone 0452 64938

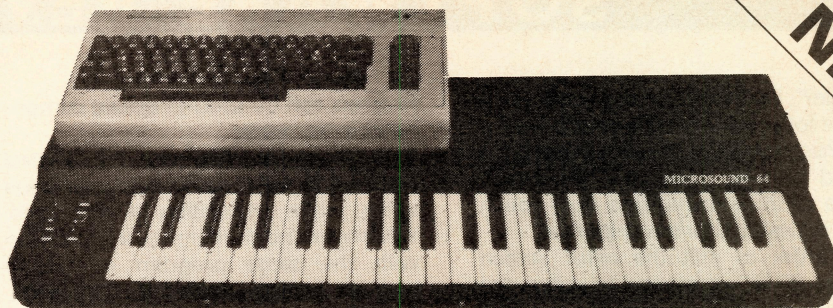
**Product:** Editor/assembler

**Applications:** Text editing and program design

**Documentation:** Manual

**Hardware required:** 64 or VIC, cassette recorder or 1540 or 1541 disk drive, minimum of 8K expansion, any compatible serial or parallel printer

**Price:** £22.95 for the disk version. £19.95 for the tape version



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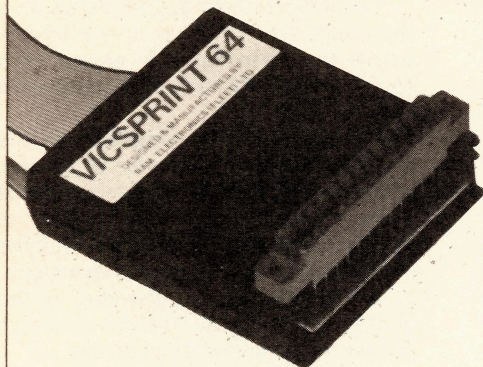
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# Pixstik pictures

Following the announcement of Commodore's International Computer Art Competition, we look at two lightpens for budding computer artists – the pixstik and the datapen. We also look at the Amber 4000, a mini-printer from Lethaby Numbering Systems.



Although the pixstik is not the most sensitive and powerful lightpen we have ever seen, the accompanying program is very good.

Once the program is loaded in, the menu of commands and colours appears on the top of the screen and stays there. The manual is clear and explains what each command does and how it can be used on the screen.

The commands are divided into four groups. By selecting the pixstik mode – the colour, the type of drawing pattern (circle or triangle for instance) and the style (paint brush or filled in) – the pixstik can be used to design a number of different types of pictures. Sixteen colours, three painting styles and several pattern shapes can be utilised. The necessary moves for each effect are explained in the manuals' drawing examples.

The program presents you with a blue screen and a black border and although it is possible to change these, the pixstik does not like certain colour combinations. The manual advises that a light screen and a dark border should be selected, but taking that advice

doesn't ensure perfect results. For instance the pixstik light grey colour would not pass over a light orange screen. Similarly, a dark pink would not even consider going over a dark blue. Altering the screens brightness often had a favourable effect but contrary to the manuals advice we found that fading the colour to almost white helped. The main irritant was when the lightpen would not go onto the control panel without altering the lightpens colour first.

Unlike most lightpens, the pixstik has no switch on the pen itself so the keyboard had to be used to control the light sensor. The sensor was comparatively weak and the pen had to be held two inches or less from the screen to have any effect. Even then it was sometimes rather insensitive, refusing to plot a continuous line unless the screen was blue or having no effect at all on the screen.

As well as the excellent paintbox program three others were included on the tape. In tic tac toe the player competes with the program to complete a full line of squares. In FLAK, enemy

aircraft must be shot down using the pixstik, and the computer and pixstik are used in Melody to turn the screen into a musical keyboard.

The Pixstik would be useful for the hobbyist who wanted a lightpen for creating pictures from a program already created. It can be used to design programs, but its limitations make it unsuitable for more professional applications.

**Product Name:** Pixstik

**Product:** Lightpen and program for creating colour graphics

**Price:** £29.95

**Pixstik package:** Lightpen

Cassette with paintbox program containing three programs

1 manual

**Pixstik details:** CBM 64 and VIC 20 versions available

Black pen (12cm long)

Black extendable cable plugs into port 1 of CBM 64 and I/O port of VIC 20

**Paintbox program features:** X-Y co-ordinates

16 colours

16 command boxes – 4 command groups

Stik mode: 1,2,3, screen and border

Shape mode: freehand, straight lines, triangles, rectangles, circles and ellipses

The options: blocks, paintbrush style and filled in.

Reset/clear

Window mode: animates, bounces and cartoon style

Memory stores 4 screen displays

3 programs: Tic tac toe, FLAK and Melody

**Requirements:** Mono or colour television/monitor

C2N cassette recorder

**Applications:** Lightpen – used with personal programs. With Program – designing pictures.

**Contact:** Computapix Ltd, Gores Road, Kirkby Industrial Estate, Liverpool. tel 051 547 2741

We were very impressed by this lightpen and the accompanying program. The lightpen has some useful features and the booklet and cassette explain exactly what these are, how the pen works, how to utilise its capabilities to their best advantage in program routines and how to effectively use the Commodore graphic abilities.

The light sensor of the pen is very powerful and will pick up information from the screen even if it is held a foot away from the screen. Local light has no effect on the lightpen so that it reacts with all colours and there is no need to alter the brilliance controls.

A red light, the LED indicator at the end of the pen, lights up whenever there is anything on the screen. This indicates to the operator whether the lightpen is working or not. Using the white switch set in the pen's side, the pen can be told to ignore any signals. This enables the operator to get the pen to the position desired before actually using it.

The various items of written information accompanying the lightpen are

lucid and fairly easy to understand, even for a comparatively inexperienced programmer. The difference between the Datapen lightpen and program and the pixstik lightpen and paintbox program (see review) is that the latter is mainly intended for use with the program already designed. The program and handbook with the datapen lightpen could be utilised to design a program such as Paintbox.

The introductory program on tape shows among other things how to find routines for your own programs. Air balloon sprites appear at the end and these can be moved around with the pen. A listing is provided and can be studied in conjunction with the program. With the Colour-Draw program the operator can draw, using either a fast or slow menu, any of the Commodore characters and colours. The drawings can be saved. The Hi-Res draw program can be used to produce high resolution drawings. Using a menu displayed on the screen, several drawing styles can be chosen; lines, dots, turtle, continuous

## Art for a

and erase. These can all be saved.

The pen draws with a fair degree of accuracy and anyone with this package and a relevant computer handbook would have a good chance of designing a program for use with this lightpen.

**Product name:** Datapen lightpen  
**Product:** Lightpen  
**Price:** £25  
**Datapen package:** Lightpen  
 Explanatory handbook  
 Cassette with introductory program and two drawing programs  
 Printed listing of introductory program  
**Datapen details:** CBM 64 and VIC 20 versions available  
 Cream pen (12.5cm long)  
 Optional rubber nozzle  
 Grey cord (1.4m) plugs into port 1 of CBM 64 and I/O port of VIC 20

# Read the small print

Lethaby Numbering Systems have produced a mini printer – the Amber 4000, a quarter the size of a more conventional printer. To work with the CBM 64 or VIC 20, a special driver program and interface is needed.

Once the driver program is loaded into the computer it is ready to print. Although the printer is unusually small, it has a varied repertoire of printing sizes and styles including graphics which are intended to provide flexible print outs. Control and escape codes are used to select the printing functions. All printing is carried out on a roll of paper similar in size and design to a till roll.

Obviously the Amber 4000 does not have the same functional capacity as a larger printer, but it can still be used in a wide variety of specialised applications. Some of the ways existing owners use it for are listed below. Programmers for instance often use it for strings of calculations, tables of figures, dumps of results and even on a limited scale, printing picture screen dumps. Printing out listings will have its restrictions because the printer will not work directly with pet graphic characters. Some hospitals and medical centres use it for recording respiratory rates and the volume of air in lungs. A small business

many find it useful, for example a tool manufacturing firm uses it to record the settings that were used to test component parts of the tools. These were then kept for future use.

The Amber 4000 is very easy to use and the accompanying manual is clear and precise. Sixty-seven control codes are listed and each of the printing

commands are explained in detail. In addition examples of the controlling programs are given. Lethaby have not yet decided how they will be marketing this printer. It is diminutive in size and the small paper roll will have a restrictive effect on printouts, but for some applications the Amber 4000 should do very well.

**Product Name**  
Amber 4000 printer.

**Product**  
Mini printer.

**Price**  
£125 (approx.).

**Printing functions**  
 27 control codes  
 True descenders  
 Underlining  
 Emphasized print  
 Hash to pound swap  
 Variable line spacing  
 Block and line graphics  
 20-46 characters per line  
 Column width 10-46 characters  
 8 line widths  
 Double height and width characters  
 Border mode.

**Other features**  
 Mini word processing function  
 Vertical tab  
 5.7cm width paper roll.

**Size**  
3"H x 6"W x 9"D.

**Weight**  
1.4 Kg

**Additional requirements**  
 Driver program for CBM 64 and VIC-20 and power supply (both included in price).  
 The CBM 64 and VIC-20 interface is available from company for 18.

**Applications**  
 Various uses in home and in small business.

**Contact**  
 Lethaby Numbering Systems, Central Way, Andover, Hampshire SP10 5AL. Tel: 0264 65951.

# HARDWARE REVIEW

## rt's sake

**Datapen features:** Insensitive to environmental light  
Red LED indicator  
Data control switch  
Fast strobe

**Program features:** Introduction to use of lightpen  
Colour draw  
Hi-Res draw

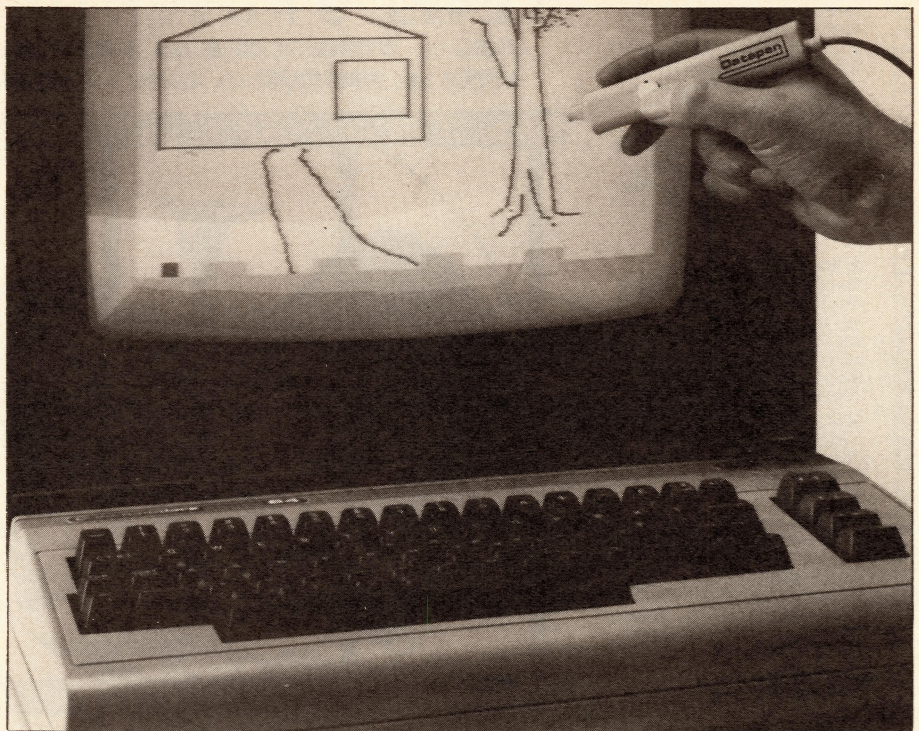
**Requirements:** Mono or colour television/monitor  
CN2 Cassette recorder

**Applications:** Creating shapes, technical drawings and moving pieces in games

Booklet explains how to access the features of the pen

**Warranty:** One year guarantee

**Contact:** Datapen Microtechnology Ltd, Kingsclere Road, Overton, Hants. Tel: 0256 770488



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Vic 20 computers have been talking back to their owners for quite some time. Now, Commodore 64 users can have that same pleasure too—by getting an ADMAN SPEECH SYNTHESISER! It's word power is endless as there is no set vocabulary. Yet operation is simple. The 64 elements of English speech are pre-programmed to let you put your words together as soon as you switch on. Just imagine.....you'll be able to program your own adventure games with characters that can actually talk. MANY LEADING SOFTWARE HOUSES ARE NOW DEVELOPING PROGRAMS THAT ARE COMPATIBLE WITH THE ADMAN 64 SPEECH SYNTHESISER. FIRST RELEASES ARE:  
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**3: DUNGEON ADVENTURE.** The trilogy is completed by this massive adventure, set in the rich caves below the shattered Black Tower. A sense of humour is essential!

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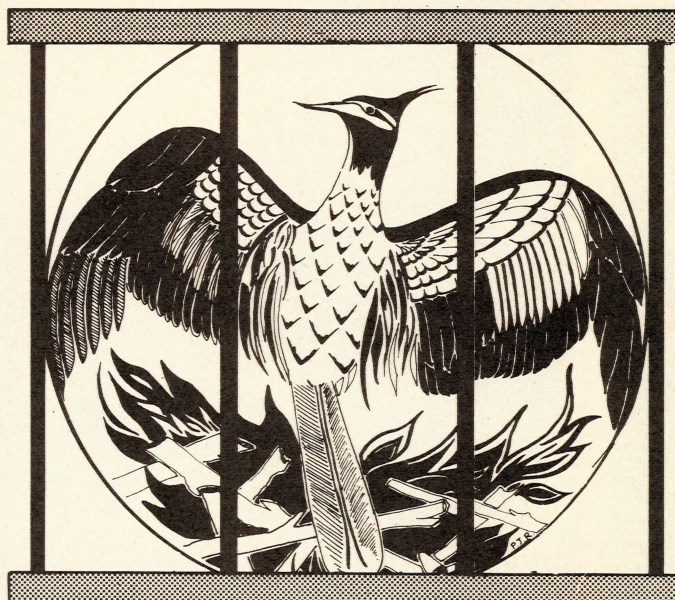
**4: SNOWBALL.** The first of Pete Austin's second trilogy. The giant colony starship, Snowball 9, has been sabotaged and is heading for the sun in this giant game with 7000 locations.

### THE LORDS OF TIME SAGA

**7: LORDS OF TIME.** Our congratulations to Sue Gazzard for her super design of this new time travel adventure through the ages of world history. Chill to the ice-age, go romin' with Caesars legions, shed light on the Dark Ages. etc. etc.

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## LEVEL 9 COMPUTING

Dept 1, 229 Hughenden Road, High Wycombe, Bucks HP13 5PG

## REVIEWS

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners... Simply smashing!" - *Soft, Sept 83*

"Colossal Adventure is included in Practical Computing's top ten games choice for 1983: 'Poetic and tough as hell.'" - *PC, Dec 83*

"To sum up, Adventure Quest is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you" - *NILUG issue 1.3*

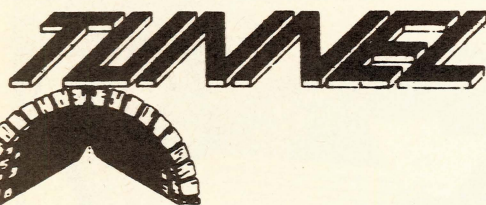
"Dungeon Adventure is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!"

- *Educational Computing, Nov 83*

"Snowball... As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens... this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers."

- *Which Micro?, Feb 84*

"Lords of Time. This program, written by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition to Level 9's consistently good catalogue. As we have come to expect from Level 9, the program is executed with wonderful style - none of those boring 'You can't do that' messages! Highly recommended." - *PCW, 1st Feb 84*



## COMMODORE 64 EXTENDED BASIC

This Package comes in the form of a cassette and a thirty page instruction manual. It is designed to allow the BASIC Programmer to make full use of the advanced sound and video interface devices built into the computer and at the same time provide useful utilities. An assembler has been included as an integral part of the package so that the advantages of BASIC and machine code can be intermixed in one program.

**LOADING:** the cassette contains the program which has to be loaded into the computer before any of the new commands can be used. This is done simply by pressing SHIFT and RUN/STOP together or by typing LOAD. Either way, the Program will load from the tape and automatically run so that it is now ready to be used. To save time when loading the program a TURBO loader is included. This is a small program which loads itself into the computer and then loads in the extended basic in a mere forty-five seconds, (as fast as if it were loaded in from a diskette). This does NOT mean that another program has to be loaded in first, all the necessary loading is fully automated once LOAD has been typed for the first time.

**LOCATION:** once the program is loaded, it will position itself in the memory behind the resident BASIC ROM and several other smaller places which are not normally used by the computer. This means that the program will only take 2.5k away, leaving 35.5k available for the storage of a BASIC program. The extended basic is 16k in length and is located from \$9800 to \$d900 hex. It does not

replace the original BASIC ROM. All the new commands work in addition with the existing basic, however, any small pieces of software enabling the computer to be used with non standard printers, etc will not work.

**INSTRUCTION MANUAL:** Provided with the program is a thirty page manual which explains how to use each command separately and in conjunction with other commands. An understanding of commodore basic is assumed.

**GRAPHIC commands:** the package allows the selecting of display modes and storage of one text and one graphic screen at the same time. There is a full set of colour and drawing commands which enable the drawing of dots, lines, solid rectangles and solid triangles. Five powerful sprite commands are included which enable fast sprite manipulation and definition.

**SOUND commands:** there are four sound commands which combined form an extremely powerful synthesiser. This section is designed to make music at a higher level than the BBC micro, for instance the pitch of a note can be represented using the standard notation 'c#5 as well as number form. This allows music to be written and debugged with much ease. All the functions of the sound device are incorporated into the new commands, as well as the software music and frequency modulation techniques.

**STRUCTURED PROGRAMMING:** there are five commands added to assist in this field. This includes

the well known PROCEDURE commands which allows second generation subroutine nesting.

**UTILITIES:** provided are commands for accessing the disc drive, copying the screen to the printer, defining the function keys, program line deletion, and other useful commands, such as RENUMBER which will renumber a program including goto's, gosub's, on... goto's, etc.

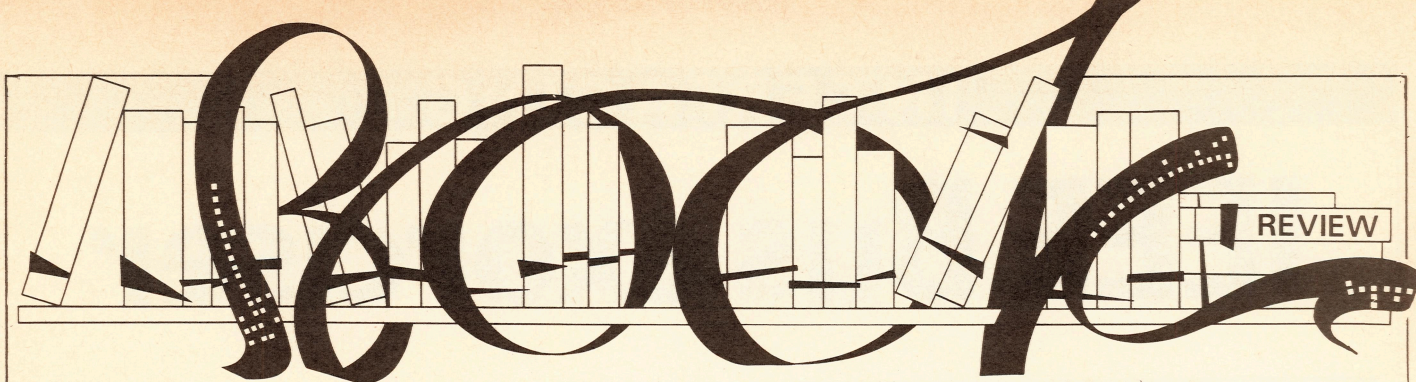
**ASSEMBLER:** the three pass assembler acts in the same way as the assembler resident in the BBC micro. The source code is contained in the BASIC program and is assembled using one of the commands.

There are in total FIFTY ONE extra multifunctional commands as well as the assembler contained in the package. The cost including postage, packing and VAT is **£14.95**

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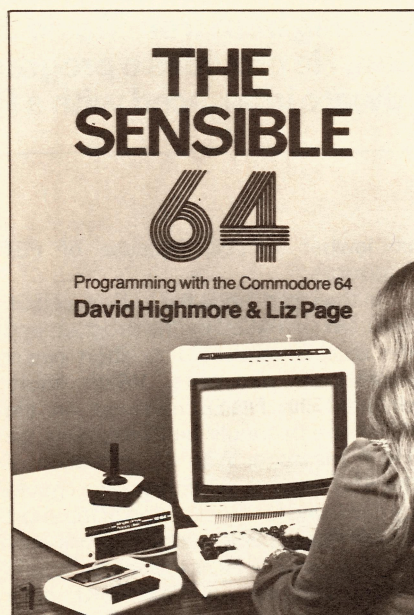
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Every growth industry produces a load of rubbish! The computer industry is no exception. The last few years have seen a phenomenal worldwide increase in the number of computers used in business and, more recently, at home. It seems that in the last few years the public has been so desperate for information about computers and so indiscriminate in its buying habits that some people have made small fortunes out of producing rubbish.

Thankfully it now looks as if things are settling down. The cowboys are beginning to collapse one by one as the public becomes more and more discriminating. This current crop of books encourages the belief that the time when you could stick a few ill thought out, badly printed and, worst of all, unchecked programs between garish cardboard covers and confidently expect to sell 20,000 copies is now past.

The books now appearing which cover Commodore machines actually look as if they're the end product of some care and thought. This is not to say there have not, until now, been no good books about Commodore machines. It's just that the good books have been



vastly outnumbered by the bad or indifferent books. Commodore 64: getting the most from it (Prentice/Hall, £7.95) is an example of the better quality books which are now arriving on the scene.

One of the reasons why Commodore machines seem to produce such a plethora of books is that the literature supplied by Commodore themselves isn't exactly the most enlightening reading possible! Commodore 64: getting the most from it, on the other hand, is enlightening. It's nowhere near as clumsily written as its title but is relatively jargon-free and easy to read.

Non-American readers may find the chatty, almost patronising, style somewhat tiresome but will nonetheless find it well worth while persevering. Three 'guest writers' have added three appendices – the ubiquitous Jim Butterfield takes us on a tour of the 64's innards, Paul Schatz explores graphics and Frank Covitz looks at sound and music. An excellent tome, warmly recommended.

The three other books about the 64 in this month's batch suffer from a comparison with Tim Onosoko's book. Getting More from your 64 (Sigma Technical Press, £6.95) by Mark Harrison



has been written and published in the UK and is a more modest book. It is good as far as it goes and is probably best described as a good, comprehensive beginner's book.

The Sensible 64 (Micro Books, £5.95) by David Highmore and Liz Page is a little bit too much like your do-it-yourself amateur publishing! It's not very well produced (the binding leaves a lot to be desired) and it's a long way behind two books we've looked at already. This is the way the book starts: the heading 'Input to the computer' is followed by 'There are times when you may wish to access information from the keyboard without using the INPUT command.' There is no introduction, no chapter heading, no real attempt at user friendliness!

The Commodore 64 Program Book (Phoenix Publishing Associates, £4.95) by Vince Apps is, as the title suggests, a book of programs. They are mainly games, although there are one or two utilities, line renumber and an assembler/disassembler. On the whole the programs are unexceptional but they seem to work. There are 25 programs in 122 pages so you can get some idea of the complexity of the programs.

# IEEE Bus exorciser

**Interfacing problems are amongst the most difficult to trace and solve. We were therefore delighted to receive the following item from David Jones at King's College London. He provides a program for testing hardware interfaced with a PET.**

If you have ever experienced instrument malfunctions in a PET-controlled IEEE Bus system, the program published here may well have been of assistance in locating the source of the problem.

The PET BASIC program enables all of the IEEE lines to be examined using either a 5V testmeter or (better) an oscilloscope. Each line is tested in both the output mode and in the input mode.

In the output mode the individual IEEE lines are pulsed by the program in turn, the pulse duration being set by the user. If a voltmeter is being used for the test then a pulse duration of about 500 ms should be selected. If using a 'scope then both short durations (1 ms) and long durations are useful. Short durations enable the rise time of the pulse to be examined while long durations enable any intermittency to be discovered. Note that if short durations are selected the pulse length will be

somewhat variable because of PET interrupts.

In the input mode the individual IEEE lines are set FALSE by the program and the user is requested to short circuit appropriate pin pairs. When short-circuited the FALSE message on the PET's screen should be replaced by the TRUE message. With the exception of the SRQ test, the TRUE message should be displayed for the duration of the short circuit. For the SRQ test TRUE will only be displayed briefly as the short circuit is made because, in PET, SRQ is a transition (as distinct from level) sensitive function.

The tests should be made at the instrument end of the IEEE cable thus testing the cable as well as the PET. If you have a number of instruments it is a good idea to connect all your IEEE cables in series and make the test at the end.

The IEEE connector pin-out will be

displayed on the screen for the duration of the test. If using a 'scope take care to ensure that the ground terminal of the test lead is connected to the ground IEEE lead and not to the active line. Jiggle the lead around while the test is in progress to make sure that the connection is not intermittent, though you will probably only be able to see intermittent contact if using a 'scope.

In my experience it is the IEEE leads or the connector on the PET IEEE port that is more likely to give trouble than PET's hardware. However the PIA's and the VIA in PET (to which the IEEE leads are connected) have been known to fail! Making the tests on an edge connector plugged onto the motherboard will enable you to decide if it is PET or the connectors or leads which are faulty.

The program should enable you to exorcise most IEEE problems associated with PET itself or with connecting leads.

```

10 L=-1
20 PRINT"IEEE BUS EXORCISER - OUTPUT":PRINT:PRINT      ! CLR
30 PRINT"THIS PROGRAM PULSES THE IEEE CONNECTOR"
40 PRINT"PINS IN SEQUENCE AT A RATE SET BY THE"
50 PRINT"USER. TEST WITH AVO METER OR (BETTER)"
60 PRINT"A SCOPE. AFTER TEST HIT ANY KEY":PRINT
70 IFLO-1THEN100
80 PRINT"ENTER REQUIRED PULSE DURATION":PRINT"IN MILLISECONDS"
90 INPUT L:GOTO20
100 PRINT"  SHIELD 12 * * 24 DIG GND      "
110 PRINT"      ATN 11 * * 23 ATN GND      C"
120 PRINT"      SRQ 10 * * 22 SRQ GND      O P"
130 PRINT"      IFC  9 * * 21 IFC GND      N I"
140 PRINT"      NDAC 8 * * 20 NDAC GND      N N"
150 PRINT"      NRFD 7 * * 19 NRFD GND      E"
160 PRINT"      DAV  6 * * 18 DAV GND      C O"
170 PRINT"      EOI  5 * * 17 REN          T U"

```

# INTERFACING

```

180 PRINT"      DIO4 4 ## 16 DIO8      0 T"
190 PRINT"      DIO3 3 ## 15 DIO7      R"
200 PRINT"      DIO2 2 ## 14 DIO6 "
210 PRINT"      DIO1 1 ## 13 DIO5 ":PRINT
220 IF FL=1 THEN 490
230 READ P:IF P=0 THEN 370
240 READ PP,F$,A,OM:AM=255-OM
250 IF P<>1 THEN 280
260 PRINT"CONNECT PROBE TO PIN 24 & 1;2;3;4;13"
270 PRINT"14;15 AND 16 IN TURN TO TEST DIO LINES":GOTO 290
280 PRINT"CONNECT TEST PROBE TO PINS ";P;" & ";PP
290 PRINT"NOW PULSING ";F$;" (";L;" MS.)"
300 GETA$:IFA$<>"":THEN 300
310 POKEA,PEEK(A)ANDAM
320 FOR I=0 TO L:NEXT
330 POKEA,PEEK(A)OROM
340 FOR I=0 TO L:NEXT
350 GETA$:IFA$="":THEN 310
360 GOTO 20
370 PRINT"NOW CHECK AS FOLLOWS:"
380 PRINT"      PIN 9/21 (IFC) SHOULD BE HIGH"
390 PRINT"      PIN 10/22 (SRQ) SHOULD BE HIGH"
400 PRINT"      PIN 17/24 (REN) SHOULD BE LOW"
410 GETA$:IFA$="":THEN 410
420 FL=1:PRINT"IEEE EXERCISER - INPUT":PRINT
430 PRINT"THIS PROGRAM TESTS IEEE INPUT."
440 PRINT"TO USE - SHORT CIRCUIT THE INDICATED"
450 PRINT"PINS. WHEN SHORTED THE 'TRUE' MESSAGE"
460 PRINT"SHOULD BE DISPLAYED. (WHEN NOT SHORTED"
470 PRINT"THE 'FALSE' MESSAGE SHOULD APPEAR). "
480 GOTO 100
490 READ P:IF P=0 THEN 810
500 READ PP,F$,A,AM
510 PRINT"TO SELECT NEXT TEST HIT ANY KEY"
520 PRINT"SHORT ";P;" AND ";PP;" (";F$;"):PRINT
530 I=PEEK(A)ANDAM
540 IF P=10 THEN I=ABS(I-128):K=PEEK(59426):REM CLR SRQ FLG
550 IF I=AM THEN PRINT" ";F$;" IS NOW FALSE "
560 IF I=0 THEN PRINT" ";F$;" IS NOW TRUE "
570 GETA$:IFA$="":THEN 530
580 GETA$:IFA$<>"":THEN 580
590 GOTO 420
600 DATA 11,23,"ATN",59456,4
610 DATA 8,20,"NDAC",59425,8
620 DATA 7,19,"NRFD",59456,2
630 DATA 6,18,"DAV",59427,8
640 DATA 5,24,"EOI",59409,8
650 DATA 1,24,"ALL DIO LINES",59426,255
660 DATA 0
670 DATA 10,22,"SRQ (TRANS SENS.)",59427,128
680 DATA 8,20,"NDAC",59456,1
690 DATA 7,19,"NRFD",59456,64
700 DATA 6,18,"DAV",59456,128
710 DATA 5,24,"EOI",59408,64
720 DATA 1,24,"DIO1",59424,1
730 DATA 2,24,"DIO2",59424,2
740 DATA 3,24,"DIO3",59424,4
750 DATA 4,24,"DIO4",59424,8
760 DATA 13,24,"DIO5",59424,16
770 DATA 14,24,"DIO6",59424,32
780 DATA 15,24,"DIO7",59424,64
790 DATA 16,24,"DIO8",59424,128
800 DATA 0
810 PRINT:PRINT:PRINT"END OF TEST "
READY.

```

! CRSR DOWN

! CLR

! CRSR UP

! RVS, RVS OFF

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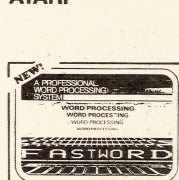


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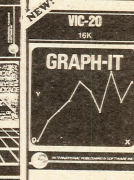
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# LETTERS

Dear Sir,

In my first letter, which you published in the February 1984 issue of *Commodore Computing*, I promised to update you on the outcome of my dealings with Commodore. I am pleased to be able to report that the matter has now been settled. In early December Commodore wrote to me advising that Commodore would honour the claim. I was required to return the equipment to them and after being checked, they would send me my refund. This they did by mid-January.

I should add that the dealer involved returned the equipment at his own expense and, contrary to your editorial comment after the published letter, I have no complaint against the dealer at all.

**Nigel Clark,  
Chesham,  
Bucks.**

Dear Sir,

I was most interested in the article on the construction of a computer piano board in the December issue of *Commodore Computing* and intend to construct the system.

However, I have so far been unable to locate a supplier of a keyboard as described in the article. I would be most grateful if you could give me the address or telephone number of a stockist.

**S Hickman,  
Bath,  
Somerset.**

*The keyboard used in our feature was supplied by mail order company Maplin Electronic Supplies, who can be contacted at PO Box 3, Rayleigh, Essex SS6 8LR. Telephone 0702 552911.*

Dear Sir,

On the game PETDO (CCI October issue) we have got control problems. We can move left, up and down, but not right. The fire control does not work either. Our computer is a PET 4016.

**Neil Morrison,  
Crawley,  
Sussex.**

*All our programs are thoroughly tested before they appear in Commodore Computing, so make sure that you have entered all data correctly. Check the values of K from Line 250 to line 290 paying particular attention to line 270 (which controls movement to the right) and line 290 (which controls fire).*

Dear Sir,

In your issue, Vol 2, No 2, in the Hints and Tips section you published a routine to disable the RUNSTOP/RESTORE keys on the VIC-20. This involved addresses 808 and 37150. I have tried using the routine on the VIC-20 (with 3K expansion) and find that although the routine works if entered in direct address before running a program, when incorporated into the listing the routine crashes and returns a BREAK ERROR message whenever a program routine is encountered which includes READ statements in a FOR ... NEXT loop. Have you any suggestions?

Also, can you refer me to any article in your magazine (or any other source) which explains how BASIC listing may be rendered 'unsaveable', ie copyproof?

**R Fletcher,  
Glasgow,  
Scotland.**

*A well-timed letter! Both these queries, are dealt with in the Hints and Tips section of this issue (April). There is a routine to disable RUNSTOP for all Commodore machines and also some useful tips to render BASIC listings unsaveable. Although the latter are intended for the 64, it should point you in the right direction.*

Dear Sir,

It was with some surprise that I saw you had published my letter on your letter page of the Bumper Christmas issue. It is easy to ignore letters of criticism, but there you were – actually showing that you do receive some. Actually I was generalising and not pointing an accusing finger at your magazine.

However, getting back to my original complaint – not being able to find a program that I can type in and RUN without a mistake occurring – I turned to a program in the December issue which would allow me 16 defined function keys. This would no doubt aid a beginner such as I.

After typing in the program I confidentially typed RUN only to be informed there was an ILLEGAL QUANTITY ERROR on line 18. Careful checking only revealed that I had typed in the program correctly so where had I gone wrong.

**Ken Whiteley,  
Hemel Hempstead,  
Herts.**

*In reply we can only reiterate that all our programs are tested on the Commodore machines here in the office and then printed out, using the printouts as artwork. This leaves little margin for error. Since receiving Ken Whiteley's letter we have run through the program again and there are no errors.*

## Reader Service

We welcome letters and queries for publication on this page. We would ask readers, however, not to send stamped address envelopes for replies. Much as we would like to answer all letters personally we regret are unable to do so. We will do our best to answer all letters and queries on this page.

Please make letters short and to the point. The editor reserves the right to edit letters where necessary. The address to write to is:

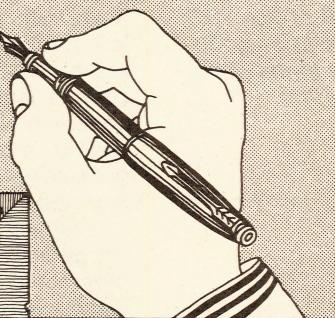
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We have set aside Thursday afternoons between 2.00pm and 5.00pm for answering telephone enquiries. If you have a query, we would rather answer it in the magazine but if you really are desperate for an answer please restrict calls to the times mentioned above. Our resident experts will not be available at other times.

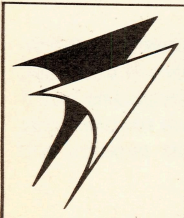
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# Program security

**This month we are going to take a look at how to secure your programs from prying eyes (and fingers).**

The first thing that is required to protect a program is the need for an auto-run ie the program will load and run whichever way it is loaded. Because there will be a lot of people reading this article we will not explain anything as to how this is done but at the end of the article there is an auto-run routine for the 64. Owners of PET computers will find an equivalent routine in the August 1983 edition.

The auto-run routine is set up so that you load the program in and run it. This will put the machine code into memory. You then load your own program and save it using: SYS(49152) "filename": SAVE in direct mode. This routine will only work on tape.

The auto-running of a program is the 'primary' form of protection. Inside your Basic program you must put some 'secondary' protection methods. These are things like disabling RUN/STOP, LIST, SAVE, etc.

## DISABLE RUN/STOP

This is done thus:

CBM 64: POKE808,251

PET B4: POKE144,88

PET B2: POKE144,49

PET B1: POKE537,136

VIC 20: POKE808,126

This command should be the first command in the Basic program. Provided that the program is totally de-bugged and will not cause any syntax errors, this is the only 'secondary' protection required.

## Disable List

Just in case the program causes an error, it would be nice to stop anybody listing the program to see how it works.

This can be done in quite a few different ways, the first would be just to stop it listing but otherwise keep the program. Or at the other extreme one could cold start the machine on the list command.

On the 64, these are done thus:

Cold start: POKE774,226: POKE775,252

Just disable: POKE774,131: POKE775,164

## Disable Save

Another useful routine to disable would be the save routine. This can be done in the same way as the disable of the list command and would have the same results.

For the 64, it would be done thus:

Cold Start: POKE818,226: POKE819,252

Just Disable: POKE818,131: POKE819,164.

## Error Messages

The above two commands could be made redundant by this command: POKE768,226: POKE769,252.

This will cause the 64 to cold start at the occurrence of any error message and thus do away with the need for the previous two.

```
10 I=49152:T=0
20 READA:IFA=-1THEN50
30 POKEI,A:T=T+A
40 I=I+1:GOTO20
50 IFT<>37131THENPRINT"CHECKSUM ERROR"37131,T:END
60 IFIC<>49431THENPRINT"NUMBER OF DATA VALUE ERROR":END
70 PRINT"#####TO SAVE A PROGRAM WITH AUTO-RUN ENTER:"
80 PRINT"#####SYS(49152)"CHR$(34)"FILENAME"CHR$(34)":SAVE":END
100 DATA165,43,141,23,193,165,44
110 DATA141,24,193,169,165,133,43
120 DATA141,2,3,169,2,133,44
130 DATA141,3,3,165,45,141,25
140 DATA193,165,46,141,26,193,169
150 DATA3,133,46,169,4,133,45
160 DATA162,86,189,192,192,157,165
170 DATA2,202,16,247,169,8,133
180 DATA252,169,0,133,251,160,1
190 DATA177,251,73,255,145,251,200
200 DATA208,247,230,252,165,252,201
210 DATA160,208,239,32,212,225,169
220 DATA3,133,185,32,89,225,173
230 DATA23,193,133,43,173,24,193
240 DATA133,44,173,25,193,133,45
```

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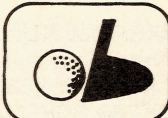
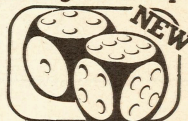
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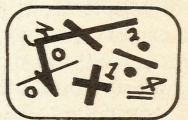
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# HINTS AND TIPS

```

250 DATA173,26,193,133,46,169,135
260 DATA141,50,3,169,192,141,51
270 DATA3,169,131,141,2,3,169
280 DATA164,141,3,3,169,0,133
290 DATA157,96,169,237,141,50,3
300 DATA169,245,141,51,3,169,1
310 DATA170,168,32,186,255,169,1
320 DATA162,121,160,192,32,189,255
330 DATA32,89,225,169,0,133,251
340 DATA169,8,133,252,160,1,177
350 DATA251,73,255,145,251,200,208
360 DATA247,230,252,165,252,201,160
370 DATA208,239,96,169,131,141,2
380 DATA3,169,164,141,3,3,169
390 DATA0,133,157,32,213,255,169
400 DATA1,170,168,32,186,255,169
410 DATA1,162,166,160,2,32,189
420 DATA255,169,0,32,213,255,134
430 DATA45,134,47,134,49,132,46
440 DATA132,48,132,50,160,0,132
450 DATA251,169,8,133,252,200,169
460 DATA255,81,251,145,251,200,208
470 DATA247,230,252,165,252,201,160
480 DATA208,239,169,0,32,94,166
490 DATA32,142,166,76,174,167,-1
READY.

```

## CURSOR CHARACTERS

␣	- By pressing the cursor down key	
␣	- By pressing the cursor down key with the shift key	
␣	- By pressing the cursor right key	
␣	- By pressing the cursor right key with the shift key	
␣	- By pressing the home key	
␣	- By pressing the home key with the shift key	
␣	- By pressing the control key and key 1	
␣	-	key 2
␣	-	key 3
␣	-	key 4
␣	-	key 5
␣	-	key 6
␣	-	key 7
␣	-	key 8
␣	- By pressing the CBM key with	key 1
␣	-	key 2
␣	-	key 3
␣	-	key 4
␣	-	key 5
␣	-	key 6
␣	-	key 7
␣	-	key 8
␣	- By pressing the control key and	key 9
␣	-	key 0
␣	-	By pressing key F1
␣	-	By pressing key F2
␣	-	By pressing key F3
␣	-	By pressing key F4
␣	-	By pressing key F5
␣	-	By pressing key F6
␣	-	By pressing key F7
␣	-	By pressing key F8

# 64 ROM routines

**Last month we described the memory location below Basic programming memory. Here, as promised, is an explanation of the ROM routines completing the memory map for the 64.**

A000; ROM control vectors	A8F8; Perform [DATA]
A00C; Keyword action vectors	A906; Scan for next statement
A052; Function vectors	A928; Perform [IF]
A080; Operator vectors	A93B; Perform [REM]
A09E; Keywords	A94B; Perform [ON]
A19E; Error messages	A96B; Get fixed point number
A328; Error message vectors	A9A5; Perform [LET]
A365; Misc messages	AA80; Perform [PRINT#]
A38A; Scan stack for FOR/GOSUB	AA86; Perform [CMD]
A3B8; Move memory	AAA0; Perform [PRINT]
A3FB; Check stack depth	AB1E; Print string from (y.a)
A408; Check memory space	AB3B; Print format character
A435; 'out of memory'	AB4D; Bad input routine
A437; Error routine	AB7B; Perform [GET]
A469; BREAK entry	ABA5; Perform [INPUT#]
A474; 'ready'	ABBF; Perform [INPUT]
A480; Ready for Basic	ABF9; Prompt & input
A49C; Handle new line	AC06; Perform [READ]
A533; Re-chain lines	ACFC; Input error messages
A560; Receive input line	AD1E; Perform [NEXT]
A579; Crunch tokens	AD78; Type match check
A613; Find Basic line	AD9E; Evaluate expression
A642; Perform [NEW]	AEA8; Constant - pi
A65E; Perform [CLR]	AEF1; Evaluate within brackets
A68E; Back up text pointer	AEF7; 'Y'
A69C; Perform [LIST]	AEFF; comma
A742; Perform [FOR]	AF08; Syntax error
A7ED; Execute statement	AF14; Check range
A81D; Perform [RESTORE]	AF28; Search for variable
A82C; Break	AFA7; Setup FN reference
A82F; Perform [STOP]	AFE6; Perform [OR]
A831; Perform [END]	AFE9; Perform [AND]
A857; Perform [CONT]	B016; Compare
A871; Perform [RUN]	B081; Perform [DIM]
A883; Perform [GOSUB]	B08B; Locate variable
A8A0; Perform [GOTO]	B113; Check alphabetic
A8D2; Perform [RETURN]	B11D; Create variable

# INSIDE BASIC

B194; Array pointer subroutine  
 B1A5; Value 32768  
 B1B2; Float-fixed  
 B1D1; Set up array  
 B245; 'bad subscript'  
 B248; 'illegal quantity'  
 B34C; Compute array size  
 B37D; Perform [FRE]  
 B391; Fix-float  
 B39E; Perform [POS]  
 B3A6; Check direct  
 B3B3; Perform [DEF]  
 B3E1; Check fn syntax  
 B3F4; Perform [FN]  
 B465; Perform [STR\$]  
 B475; Calculate string vector  
 B487; Set up string  
 B4F4; Make room for string  
 B526; Garbage collection  
 B5BD; Check salvageability  
 B606; Collect string  
 B63D; Concatenate  
 B67A; Build string to memory  
 B6A3; Discard unwanted string  
 B6DB; Clean descriptor stack  
 B6EC; Perform [CHR\$]  
 B700; Perform [LEFT\$]  
 B72C; Perform [RIGHT\$]  
 B737; Perform [MID\$]  
 B761; Pull string parameters  
 B77C; Perform [LEN]  
 B782; Exit string-mode  
 B78B; Perform [ASC]  
 B79B; Input byte parameter  
 B7AD; Perform [VAL]  
 B7EB; Parameters for POKE/WAIT  
 B7F7; Float-fixed  
 B80D; Perform [PEEK]  
 B824; Perform [POKE]  
 B82D; Perform [WAIT]  
 B849; Add 0.5  
 B850; Subtract-from  
 B853; Perform [subtract]  
 B86A; Perform [add]  
 B947; Complement FAC#1  
 B97E; 'overflow'  
 B983; Multiply by zero byte  
 B9EA; Perform [LOG]  
 BA2B; Perform [multiply]  
 BA59; Multiply-a-bit  
 BA8C; Memory to FAC#2  
 BAB7; Adjust FAC#1/#2

BAD4; Underflow/overflow  
 BAE2; Multiply by 10  
 BAF9; + 10 in floating pt  
 BAFE; Divide by 10  
 BB12; Perform [divide]  
 BBA2; Memory to FAC#1  
 BBC7; FAC#1 to memory  
 BBFC; FAC#2 to FAC#1  
 BC0C; FAC#1 to FAC#2  
 BC1B; Round FAC#1  
 BC2B; Get sign  
 BC39; Perform [SGN]  
 BC58; Perform [ABS]  
 BC5B; Compare FAC#1 to mem  
 BC9B; Float-fixed  
 BCCC; Perform [int]  
 BCF3; String to FAC  
 BD7E; Get ascii digit  
 BDC2; Print 'IN...'  
 BDCD; Print line number  
 BDDD; Float to ascii  
 BF16; Decimal constants  
 BF3A; TI constants  
 BF71; Perform [SQR]  
 BF7B; Perform [power]  
 BFB4; Perform [negative]  
 BFED; Perform [EXP]  
 E043; Series eval 1  
 E059; Series eval 2  
 E097; Perform [RND]  
 E0f9; ?? breakpoints ??  
 E12A; Perform [SYS]  
 E156; Perform [SAVE]  
 E165; Perform [VERIFY]  
 E168; Perform [LOAD]  
 E1BE; Perform [OPEN]  
 E1C7; Perform [CLOSE]  
 E1D4; Parameters for LOAD/SAVE  
 E206; Check default parameters  
 E20E; Check for comma  
 E219; Parameters for open/close  
 E264; Perform [COS]  
 E26B; Perform [SIN]  
 E2B4; Perform [TAN]  
 E30E; Perform [ATN]  
 E37B; Warm restart  
 E394; Initialize  
 E3A2; CHRGET for zero page  
 E3BF; Initialize Basic  
 E447; Vectors for \$300  
 E453; Initialize vectors  
 E45F; Power-up message

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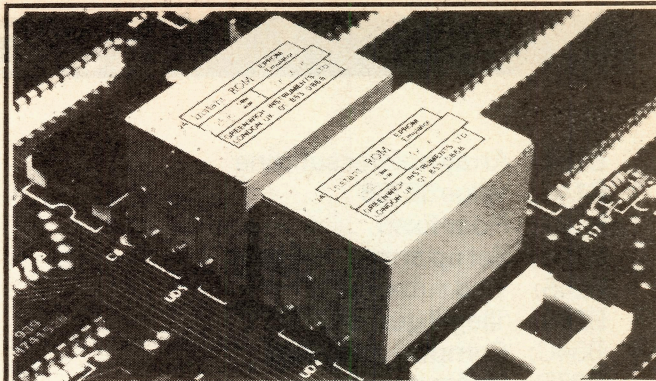
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# INSIDE BASIC

E500;	Get I/O address	EDFE;	Send 'unlisten'
E505;	Get screen size	EE13;	Receive from serial bus
E50A;	Put/get row/column	EE85;	Serial clock on
E518;	Initialize I/O	EE8E;	Serial clock off
E544;	Clear screen	EE97;	Serial output '1'
E566;	Home cursor	EEA0;	Serial output '0'
E56C;	Set screen pointers	EEA9;	Get serial in & clock
E5A0;	Set I/O defaults	EEB3;	Delay 1 ms
E5B4;	Input from keyboard	EEBB;	RS-232 send
E632;	Input from screen	EF06;	Send new RS-232 byte
E684;	Quote test	EF2E;	No-DSR error
E691;	Setup screen print	EF31;	No-CTS error
E6B6;	Advance cursor	EF3B;	Disable timer
E6ED;	Retreat cursor	EF4A;	Compute bit count
E701;	Back into previous line	EF59;	RS232 receive
E716;	Output to screen	EF7E;	Setup to receive
E87C;	Got to next line	EFC5;	Receive parity error
E891;	Perform <return>	EFCA;	Receive overflow
E8A1;	Check line decrement	EFCD;	Receive break
E8B3;	Check line increment	EFD0;	Framing error
E8CB;	Set colour code	EFE1;	Submit to RS232
E8DA;	Colour code table	F00D;	No-DSR error
E8EA;	Scroll screen	F017;	Send to RS232 buffer
E965;	Open space on screen	F04D;	Input from RS232
E9C8;	Move a screen line	F086;	Get from RS232
E9E0;	Synchronize colour transfer	F0A4;	Check serial bus idle
E9F0;	Set start-of-line	F0BD;	Messages
E9FF;	Clear screen line	F12B;	Print if direct
EA13;	Print to screen	F13E;	Get ...
EA24;	Synchronize colour pointer	F14E;	... from RS232
EA31;	Interrupt - clock etc	F157;	Input
EA87;	Read keyboard	F199;	Get ... tape/serial/rs232
EB79;	Keyboard select vectors	F1CA;	Output ...
EB81;	Keyboard 1 - unshifted	F1DD;	... to tape
EBC2;	Keyboard 2 - shifted	F20E;	Set input device
EC03;	Keyboard 3 - 'comm'	F250;	Set output device
EC44;	Graphics/text contrl	F291;	Close file
EC4F;	Set graphics/text mode	F30F;	Find file
EC78;	Keyboard 4	F31F;	Set file values
ECB9;	Video chip setup	F32F;	Abort all files
ECE7;	Shift/run equivalent	F333;	Restore default I/O
ECF0;	Screen In address low	F34A;	Do file open
ED09;	Send 'talk'	F3D5;	Send SA
ED0C;	Send 'listen'	F409;	Open RS232
ED40;	Send to serial bus	F49E;	Load program
EDB2;	Serial timeout	F5AF;	'searching'
EDB9;	Send listen SA	F5C1;	Print filename
EDBE;	Clear ATN	F5D2;	'loading/verifying'
EDC7;	Send talk SA	F5DD;	Save program
EDCC;	Wait for clock	F68F;	Print 'saving'
EDDD;	Send serial deferred	F69B;	Bump clock
EDEF;	Send 'untalk'	F6BC;	Log PIA key reading



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 F6E4; Set time  
 F6ED; Check stop key  
 F6FB; Output error messages  
 F72D; Find any tape header  
 F76A; Write tape header  
 F7D0; Get buffer address  
 F7D7; Set buffer start/end pointers  
 F7EA; Find specific header  
 F80D; Bump tape pointer  
 F817; 'press play...'  
 F82E; Check tape status  
 F838; 'press record...'  
 F841; Initiate tape read  
 F864; Initiate tape write  
 F875; Common tape code  
 F8D0; Check tape stop  
 F8E2; Set read timing  
 F92C; Read tape bits  
 FA60; Store tape chars  
 FB8E; Reset pointer  
 FB97; New character setup  
 FBA6; Send transition to tape  
 FBC8; Write data to tape  
 FBCE; IRQ entry point  
 FC57; Write tape leader  
 FC93; Restore normal IRQ  
 FCB8; Set IRQ vector  
 FCCA; Kill tape motor  
 FCD1; Check r/w pointer  
 FCDB; Bump r/w pointer  
 FCE2; Power reset entry  
 FD02; Check 8-rom  
 FD10; 8-rom mask  
 FD15; Kernal reset  
 FD1A; Kernal move  
 FD30; Vectors  
 FD50; Initialize system constants  
 FD9B; IRQ vectors  
 FDA3; Initialize I/O  
 FDDD; Enable timer  
 FDF9; Save filename data  
 FE00; Save file details  
 FE07; Get status  
 FE18; Flag status  
 FE1C; Set status  
 FE21; Set timeout  
 FE25; Read/set top of memory  
 FE27; Read top of memory  
 FE2D; Set top of memory  
 FE34; Read/set bottom of memory  
 FE43; NMI entry

FE66; Warm start  
 FEB6; Reset IRQ & exit  
 FEBC; Interrupt exit  
 FEC2; RS-232 timing table  
 FED6; NMI RS-232 in  
 FF07; NMI RS-232 out  
 FF43; Fake IRQ  
 FF48; IRQ entry  
 FF81; Jumbo jump table  
 FFFA; Hardware vectors

Address	Effect
FF84	Initialise I/O
FF87	Initialise System Constants
FF8A	Kernal Reset
FF8D	Kernal Move
FF90	Flag Status
FF93	Send Listen SA
FF96	Send Talk SA
FF99	Read/Set top of memory
FF9C	Read/Set bottom of memory
FF9F	Read Keyboard
FFA2	Set Timeout
FFA5	Receive From Serial
FFA8	Send Serial Deferred
FFAB	Send 'Untalk'
FFAE	Send 'Unlisten'
FFB1	Send 'Listen'
FFB4	Send 'Talk'
FFB7	Get Status
FFBA	Set File Details
FFBD	Set Filename Details
FFC0	Open
FFC3	Close
FFC6	Set Input Device
FFC9	Set Output Device
FFCC	Restore I/O
FFCF	Input
FFD2	Output
FFD5	Load
FFD8	Save
FFDB	Set Time
FFDE	Get Time
FFE1	Test Stop
FFE4	Get
FFE7	Abort I/O
FFEA	Bump Clock
FFED	Get Screen Size
FFF0	Put/Get Row/Column
FFF3	Get I/O Address

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# Tear down the wall

In this month's Basic Programming, we have two programs for the 64 and one for the VIC. For the 64 there is an implementation of the old arcade game Breakout, and a program that displays the time on the screen using Sprites for the numerals. For the VIC we have a graphics generator.

```

10 REM BREAKOUT
20 REM *****
30 REM
40 GOTO1160
50 REM
60 REM
70 GOSUB1050
80 POKE53280,4:POKE53281,0:P=8:BA=5
90 REM
100 REM DISPLAY
110 REM
115 S$=CHR$(160)
120 PRINT"  _____ ";
121 PRINT"          "S$;
130 FORI=1TO23
140 PRINT"  ";
141 FORJ=1TO37:PRINT" ";:NEXT
149 PRINT"  "S$"  "
150 NEXT
160 PRINT"  ";
161 FORI=1TO37:PRINTS$;:NEXT
169 PRINT"  "S$"  "S$"
170 PRINT"  "A$="  "
175 A$=A$+"  "
180 PRINT"  "A$:PRINT"  "A$
190 PRINT"  "A$:PRINT"  "A$
200 PRINT"  "A$:PRINT"  "A$
210 PRINT"  "A$:PRINT"  "A$
220 A(1)=126:A(2)=108
230 A(3)=123:A(4)=124:R=0:O=0:V=41:Y=1
240 REM
250 REM RANDOM BALL START POSITION
260 REM AND DIRECTION
270 REM
280 Z=1505+INT(RND(1)*38)
290 G=INT(RND(1)*2)
300 IFG=1THENR=1

```

## Breakout:

A nice version of the popular arcade game 'Breakout'. This game incorporates sound and the ability to send the ball back in the direction it came using the edge of the bat. The bat is controlled with a small machine code routine entered into memory. The machine code routine reads the keyboard and if it is a cursor key (direction control) it will move the bat in that direction.

When a ball has gone out, pressing the space bar will release the next ball. When a screen is cleared, a new screen will be displayed and the ball will start at a random point.

# BASIC PROGRAMMING

```
310 IFG=0THENR=3
320 PRINT"SCORE"SC
330 PRINT"BALL NO"BA
340 IF BA<>0 THEN 430
350 PRINT"CANOTHER GAME ?";
360 GET A$:IF A$="" THEN 360
370 IF A$="Y" THEN RUN
380 IF A$<>"N" THEN 360
390 PRINT"POKE53280,14:POKE53281,6:END
400 REM
410 REM PLAY GAME AND MOVE BAT WITH SYS 49152
420 REM
430 SYS49152
440 R=R+1
450 IF0=1THENIFR>4THENR=3:Z=Z+V:POKEZ-V,32:GOTO480
460 IF0=1THEN480
470 IFR>2THENR=1:Z=Z+V:POKEZ-V,32
480 X=PEEK(Z)
485 SYS49152
486 IFX=32THEN580
490 IFX=120THENGOTO1300
500 IFX=207THENK= 1:GOTO1310
510 IFX=208THENK=-1:GOTO1310
520 IFX=160THENGOSUB1320:GOTO660
530 IFX=224THENGOSUB1320:GOTO730
540 IFX=228THENGOSUB1320:GOTO590
550 IFX<>96THEN580
560 BA=BA-1:POKE5+18,129:POKE5+18,128
570 GETA$:IFA$<>" "THEN570
575 GOTO220
580 POKEZ,A(R):GOTO430
590 Y=1
600 IFNOT(R=1ORR=2)THEN630
610 Z=Z+40:R=3:V=39:O=1
620 A(3)=124:A(4)=123:GOTO430
630 IFNOT(R=3ORR=4)THEN660
640 Z=Z+40:R=1:V=41:O=0
650 A(1)=126:A(2)=108:GOTO430
660 REM
670 IFNOT(R=1ORR=2)THEN700
680 Z=Z+1:R=3:V=-39:O=1
690 A(3)=123:A(4)=124:GOTO430
700 IFNOT(R=3ORR=4)THEN730
710 Z=Z+1:R=1:V=41:O=0
720 A(1)=126:A(2)=108:GOTO430
730 REM
740 IFNOT(R=1ORR=2)THEN770
750 Z=Z-1:R=3:V=39:O=1
760 A(3)=124:A(4)=123:GOTO430
770 IFNOT(R=3ORR=4)THEN800
780 Z=Z-1:R=1:V=-41:O=0
790 A(1)=108:A(2)=126:GOTO430
```

# BASIC PROGRAMMING

```
800 Y=0
810 IFNOT(R=10RR=2)THEN840
820 Z=Z-40:R=3:V=-39:O=1
825 A(3)=123:A(4)=124
830 IFZ+40<>PEEK(251)+PEEK(252)*256+1THEN320
835 R=1:V=-41:O=0:A(1)=108:A(2)=126:GOTO320
840 IFNOT(R=30RR=4)THEN870
850 Z=Z-40:R=1:V=-41:O=0
855 A(1)=108:A(2)=126
860 IFZ+40<>PEEK(251)+PEEK(252)*256+3THEN320
865 R=3:V=-39:O=1:A(3)=123:A(4)=124:GOTO320
870 POKEZ,32:POKEZ+K,32
880 IFZ<1264THENSC=SC+7:GOTO920
890 IFZ<1344THENSC=SC+5:GOTO920
900 IFZ<1424THENSC=SC+3:GOTO920
910 IFZ<1504THENSC=SC+1
920 POKE54272+Z,1:POKE54272+Z+K,1
930 IFSC/608=INT(SC/608)THEN170
940 IFY=1THEN800
950 Y=1
960 IFNOT(R=10RR=2)THEN990
970 Z=Z+40:R=3:V=39:O=1
980 A(3)=124:A(4)=123:GOTO320
990 IFNOT(R=30RR=4)THEN1050
1000 Z=Z+40:R=1:V=41:O=0
1010 A(1)=126:A(2)=108:GOTO320
1020 REM
1030 REM INSTRUCTIONS
1040 REM
1050 POKE53280,2:POKE53281,2
1055 PRINT"*** 64 BREAKOUT ***"
1060 PRINTTAB(12)"YOU MOVE WITH :
1070 PRINTTAB(11)"↑CRSR↑ MOVE LEFT
1080 PRINTTAB(11)"←CRSR← MOVE RIGHT
1090 PRINTTAB(13)"HIT ANY KEY
1100 GETA$:IFA$=""THEN1100
1110 RETURN
1120 REM
1130 REM MACHINE CODE ROUTINE TO CHANGE
1140 REM POSITION OF THE BAT
1150 REM
1160 POKE251,208:POKE252,7
1180 FORI=49152TO49206
1190 READA:POKEI,A:NEXT:GOTO1280
1200 DATA165,197,201,2,208,11,164
1210 DATA251,192,227,240,37,230,251
1220 DATA76,29,192,201,7,208,28
1230 DATA164,251,192,192,240,22,198
1240 DATA251,160,4,185,50,192,145
1250 DATA251,136,16,248,169,160,141
1260 DATA192,7,169,224,141,231,7
1270 DATA96,96,120,120,120,96
```



# BASIC PROGRAMMING

```

1280 S=54272:FORI=0TO24:POKE S+I,0:NEXT
1281 POKE S,135:POKE S+1,33
1282 POKE S+7,195:POKE S+8,16
1283 POKE S+14,97:POKE S+15,8
1284 POKE S+5,0:POKE S+6,248
1285 POKE S+12,0:POKE S+13,248
1286 POKE S+19,0:POKE S+20,251
1287 POKE S+4,16:POKE S+11,16:POKE S+18,128
1288 POKE S+24,15
1289 GOTO50
1300 POKE S+4,17:POKE S+4,16:GOTO800
1310 POKE S+11,17:POKE S+11,16:GOTO870
1320 POKE S+4,17:POKE S+4,16:RETURN
READY.

```

```

10 REM DIGICLOCK USING SPRITES FOR THE
20 REM NUMBERS.
30 REM
100 GOSUB 31000:REM GET SPRITES
110 PRINT"PLEASE ENTER THE TIME IN THE FORMAT"
120 PRINT"      HHMMSS";
130 INPUTTA$
140 IF LEN(TA$)=6 THEN TI$=TA$
150 V=53248
160 FORI=0TO7
170 POKEV+I*2,(I*40+20)AND255
180 POKEV+I*2+1,130
220 POKEV+39+I,7
230 IFI=20RI=5THENPOKEV+39+I,0
240 POKE2040+I,244
250 NEXT
260 POKEV+33,2
270 POKEV+32,0
280 POKEV+21,255
290 POKEV+23,255
300 POKEV+29,255
310 POKEV+16,0
320 POKE2042,255:POKE2045,255
330 POKEV+16,192
340 PRINT"  HOURS      ";
345 PRINT"MIN.      SECS."
350 PRINT"  _____  ";
355 PRINT"  _____  "
370 FORI=0TO7
380 IFI=20RI=5THEN430
390 A=I+1:IFA>6THENA=A-1
400 IFA>3THENA=A-1
410 B=VAL(MID$(TI$,A,1))
420 POKE2040+I,B+245
430 NEXT
440 POKEV+44,0:CLR:T$=TI$:V=53248

```

## Digiclock:

For all of you time-keepers out there, here is a program that displays the entered time (24 hour) onto the 64's screen with the use of enlarged Sprites. The data values at the end are for the ten numerals and the large colon(:).

# BASIC PROGRAMMING

```

450 IFTI$=T$THEN450
460 POKEV+44,2:GOTO370
30000 DATA246
30001 DATA0,0,0,0,0,0
30002 DATA0,0,0,0,0,28
30003 DATA0,0,36,0,0,68,0
30004 DATA0,132,0,1,4,0,1
30005 DATA100,0,1,164,0,0,36
30006 DATA0,0,36,0,0,36,0
30007 DATA0,36,0,0,36,0,0
30008 DATA36,0,0,36,0,1,231
30009 DATA128,1,0,128,1,255,128
30010 DATA247
30011 DATA0,0,0,0,0,0,0
30012 DATA0,0,0,0,0,0,126
30013 DATA0,0,129,0,1,60,128
30014 DATA2,66,64,2,66,64,2
30015 DATA66,64,3,194,64,0,4
30016 DATA128,0,9,0,0,18,0
30017 DATA0,36,0,0,72,0,0
30018 DATA144,0,1,32,0,2,127
30019 DATA192,2,0,64,3,255,192
30020 DATA248
30021 DATA0,0,0,0,0,0,0
30022 DATA0,0,0,0,0,0,124
30023 DATA0,0,130,0,1,57,0
30024 DATA2,68,128,2,68,128,3
30025 DATA196,128,0,4,128,0,9
30026 DATA0,0,18,0,0,9,0
30027 DATA0,4,128,3,196,128,2
30028 DATA68,128,2,68,128,1,57
30029 DATA0,0,130,0,0,124,0
30030 DATA249
30031 DATA0,0,0,0,0,0,0
30032 DATA0,0,0,0,0,0,15
30033 DATA0,0,17,0,0,33,0
30034 DATA0,73,0,0,153,0,1
30035 DATA41,0,2,73,0,4,137
30036 DATA0,4,249,224,4,0,32
30037 DATA7,249,224,0,9,0,0
30038 DATA9,0,0,9,0,0,9
30039 DATA0,0,9,0,0,15,0
30040 DATA250
30041 DATA0,0,0,0,0,0,0
30042 DATA0,0,0,0,0,3,255
30043 DATA192,2,0,64,2,127,192
30044 DATA2,64,0,2,64,0,2
30045 DATA64,0,2,126,0,2,1
30046 DATA0,3,252,128,0,2,64
30047 DATA0,2,64,0,2,64,3
30048 DATA194,64,2,66,64,1,60
30049 DATA128,0,129,0,0,126,0
30050 DATA251

```

```

30051 DATA0,0,0,0,0,0,0
30052 DATA0,0,0,0,0,0,127
30053 DATA0,0,128,128,1,62,64
30054 DATA2,65,192,2,64,0,2
30055 DATA64,0,2,64,0,2,126
30056 DATA0,2,1,0,2,60,128
30057 DATA2,66,64,2,66,64,2
30058 DATA66,64,2,66,64,1,60
30059 DATA128,0,129,0,0,126,0
30060 DATA252
30061 DATA0,0,0,0,0,0,0
30062 DATA0,0,0,0,0,3,255
30063 DATA192,2,0,64,3,254,64
30064 DATA0,2,64,0,2,64,0
30065 DATA4,128,0,4,128,0,9
30066 DATA0,0,9,0,0,18,0
30067 DATA0,18,0,0,36,0,0
30068 DATA36,0,0,72,0,0,72
30069 DATA0,0,144,0,0,240,0
30070 DATA253
30071 DATA0,0,0,0,0,0,0
30072 DATA0,0,0,0,0,0,124
30073 DATA0,0,130,0,1,57,0
30074 DATA2,68,128,2,68,128,2
30075 DATA68,128,2,68,128,1,57
30076 DATA0,0,130,0,1,57,0
30077 DATA2,68,128,2,68,128,2
30078 DATA68,128,2,68,128,1,57
30079 DATA0,0,130,0,0,124,0
30080 DATA254
30081 DATA0,0,0,0,0,0,0
30082 DATA0,0,0,0,0,0,126
30083 DATA0,0,129,0,1,60,128
30084 DATA2,66,64,2,66,64,2
30085 DATA66,64,2,66,64,1,60
30086 DATA64,0,128,64,0,126,64
30087 DATA0,2,64,0,2,64,0
30088 DATA2,64,3,130,64,2,124
30089 DATA128,1,1,0,0,254,0
30090 DATA245
30091 DATA0,0,0,0,0,0,0
30092 DATA0,0,0,0,0,0,255
30093 DATA0,1,0,128,2,126,64
30094 DATA4,129,32,4,130,32,4
30095 DATA132,32,4,137,32,4,147
30096 DATA32,4,165,32,4,201,32
30097 DATA4,145,32,4,33,32,4
30098 DATA65,32,4,129,32,2,126
30099 DATA64,1,0,128,0,255,0
30100 DATA255
30101 DATA0,0,0,0,0,0,0
30102 DATA0,0,0,0,0,0,60
30103 DATA0,0,126,0,0,126,0

```

# BASIC PROGRAMMING

```

30104 DATA0,126,0,0,126,0,0
30105 DATA60,0,0,0,0,0,0
30106 DATA0,0,0,0,0,0,0
30107 DATA0,0,0,0,60,0,0
30108 DATA126,0,0,126,0,0,126
30109 DATA0,0,126,0,0,60,0
30110 DATA-1
31000 READA:IFA=-1THEN31040
31010 FORI=0TO62:READX
31020 POKE64*A+I,X:NEXT
31030 GOTO31000
31040 FORI=0TO62:POKE244*64+I,0:NEXT
31050 RETURN
READY.

```

```

0 REM NOTE: THIS PROGRAM USES 3528 BYTES
1 GOSUB7500
2 GOSUB9000
3 GOSUB7000
5 Z=0:Y=0:X=0:W=0:V=0:U=0:T=0:S=0
10 PRINT"XXXXXXXXXXXXXXXX1122334455667788"
20 PRINT"XXXXXXXX"
30 PRINT"XXXX1 | |"
40 PRINT"XXXX32 | |"
50 PRINT"XXXX3 | |"
60 PRINT"XXXX24 | |"
70 PRINT"XXXX5 | |"
80 PRINT"XXXX36 | |"
90 PRINT"XXXX7 | |"
100 PRINT"XXXX38 | |"
110 PRINT"XXXXXX"
200 A=38560:B=7840
210 POKEA,0:POKEB,86
220 GETA#
240 IFPEEK(B+1)<>32ORPEEK(B+1)=160THENGOTO260
250 IFA$="|"THENA=A+1:B=B+1:POKEB-1,32
260 IFPEEK(B-1)<>32ORPEEK(B-1)=160THENGOTO280
270 IFA$="|"THENA=A-1:B=B-1:POKEB+1,32
280 IFPEEK(B-22)<>32ORPEEK(B-22)=160THENGOTO300
290 IFA$="|"THENA=A-22:B=B-22:POKEB+22,32
300 IFPEEK(B+22)<>32ORPEEK(B+22)=160THENGOTO320
310 IFA$="|"THENA=A+22:B=B+22:POKEB-22,32
320 IFA$="|"THENGOTO1000
330 PRINT"GO TO FILL IN LAST SQUARE PRESS 'G'"
335 PRINT"XXXXXXXXXXXXXXXXXXXX";
340 PRINT"PRESS CLRHOME TO REDO.PRESS 'F' TO FINISH PRESS SPACE TO CREATE"
360 IFA$="S"THEN3
361 IFA$="|"THENGOSUB6000
362 IFA$="|"THENGOSUB6500
363 IFA$="|"THENGOSUB6600
364 IFA$="|"THENGOSUB6700
370 IFA$="G"THENPOKEB,160:GOTO8000
371 IFA$="F"THENGOTO8000
380 GOTO210
1000 IFPEEK(B+1)=32ANDPEEK(B+1)<>160THENA=A+1:B=B+1:POKEB-1,0:POKEB-1,160:GOTO33
0

```

## Graphics Generator:

This program, written by Simon Reeves of West Sussex, gives the facility for drawing up characters on an 8x8 grid and when the drawing has been completed, it will give the data values for the character. These values can be noted and used in any program using user defined characters.

Instructions on how it is used are included in the program.

# BASIC PROGRAMMING

```
1010 IFPEEK(B-1)=32ANDPEEK(B-1)<>160THENA=A-1:B=B-1:POKEA+1,0:POKEB+1,160:GOTO330
0
1020 IFPEEK(B+22)=32ANDPEEK(B+22)<>160THENA=A+22:B=B+22:POKEA-22,0:POKEB-22,160:
GOTO330
1030 IFPEEK(B-22)=32ANDPEEK(B-22)<>160THENA=A-22:B=B-22:POKEA+22,0:POKEB+22,160:
GOTO330
5000 GOTO330
6000 IFPEEK(B-22)=160THENPOKEB-22,32:RETURN
6010 RETURN
6500 IFPEEK(B+22)=160THENPOKEB+22,32:RETURN
6510 RETURN
6600 IFPEEK(B-1)=160THENPOKEB-1,32:RETURN
6610 RETURN
6700 IFPEEK(B+1)=160THENPOKEB+1,32:RETURN
6710 RETURN
7000 PRINT"IM USE THESE KEYS FOR CERTAIN FUNCTIONS":PRINT"XUSE CRSR KEYS TO
MOVE"
7010 PRINT"XCLRHOME TO START AGAIN"
7020 PRINT"XOF1-DELETE BLOCK ABOVE ";
7030 PRINT"F3-DELETE BLOCK BELOW ";
7040 PRINT"F5-DELETE BLOCK BEHIND";
7050 PRINT"F7-DELETE BLOCK BEFORE";
7060 PRINT"X PRESS T"
7070 GETAA$:IFAA$=""THEN7070
7080 IFAA$<"T"THENGOTO7070
7090 RETURN
7500 REM
7505 PRINT"J":PRINT"XXXXXXXXX GRAPHICS GENERATOR"
7510 PRINT"X BY SIMON REEVES"
7520 PRINT"XXXXXXXXX PRESS A KEY":POKE198,0:WAIT198,1:POKE198,0:RETURN
8000 ZA=128
8010 FORYA=7840TO7847
8020 IFPEEK(YA)=160THENZ=Z+ZA
8030 IFZA=1THENGOTO8060
8040 ZA=ZA/2
8050 NEXTYA
8060 ZA=128
8070 FORYA=7862TO7869
8080 IFPEEK(YA)=160THENY=Y+ZA
8090 IFZA=1THENGOTO8120
8100 ZA=ZA/2
8110 NEXTYA
8120 ZA=128
8130 FORYA=7884TO7891
8140 IFPEEK(YA)=160THENX=X+ZA
8150 IFZA=1THENGOTO8180
8160 ZA=ZA/2
8170 NEXTYA
8180 ZA=128
8190 FORYA=7906TO7913
8200 IFPEEK(YA)=160THENW=W+ZA
8210 IFZA=1THENGOTO8240
8220 ZA=ZA/2
8230 NEXTYA
8240 ZA=128
8250 FORYA=7928TO7935
8260 IFPEEK(YA)=160THENV=V+ZA
8270 IFZA=1THENGOTO8300
8280 ZA=ZA/2
8290 NEXTYA
8300 ZA=128
8310 FORYA=7950TO7957
8320 IFPEEK(YA)=160THENU=U+ZA
8330 IFZA=1THENGOTO8360
8340 ZA=ZA/2
8350 NEXTYA
8360 ZA=128
8370 FORYA=7972TO7979
8380 IFPEEK(YA)=160THENT=T+ZA
```

# BASIC PROGRAMMING

```

8390 IFZA=1THENGOTO8420
8400 ZA=ZA/2
8410 NEXTYA
8420 ZA=128
8430 FORYA=7994TO8001
8440 IFPEEK(YA)=160THENS=S+ZA
8450 IFZA=1THENGOTO8700
8460 ZA=ZA/2
8470 NEXTYA
8700 PRINT"J":PRINT"80000YOUR DATAS ARE"
8710 PRINT"80000DATA";Z";";Y";";X";";W";";V";";U";";T";";S
8720 PRINT"80000 PRESS T TO CONTINUE"
8730 PRINT"80000 PRESS E TO ESCAPE"
8740 GETAA$:IFAA$=""THEN8740
8750 IFAA$="T"THENGOTO3
8760 IFAA$="E"THEN9999
8770 IFAA$<>"T"ORAA$<>"E"THENGOTO8740
9000 PRINT"780 GRAPHICS GENERATOR"
9010 PRINT"780 _____"
9020 PRINT"780THIS PROGRAM WORKS OUTDATAS FOR USER-DEFINEDCHARACTERS."
9030 PRINT"780USING THE SPACE BAR YOU DRAW A SHAPE IN THE 8 X 8 BOX ON THE SC
REEN; ";
9040 PRINT"AS THOUGH YOU WERE DRAWING IT ON A PIECE OF GRAPH PAPER."
9045 PRINT"8000000000PRESS A KEY"
9046 POKE198,0:WAIT198,1:POKE198,0:PRINT"780 GRAPHICS GENERATOR
" "
9050 PRINT"780YOU MOVE AN 'X' AROUNDTHE BOX AND BY USING CERTAIN KEYS YOU CAN CR
EATE ";
9060 PRINT"A BLOCK AS ON GRAPH PAPER AND DELETEWHEN NOT REQUIRED."
9080 PRINT"800000 TO SEE WHICH KEYS TO800000 USE:800000 PRESS ANY KEY."
9100 POKE198,0:WAIT198,1:POKE198,0:PRINT"J":RETURN
9999 PRINT"J":END

```

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# COMMODORE SOFTWARE

Native compilers for the CBM 64 and the 700/B-128 are available only from Commodore.

**Oxford Computer Systems (Software) Ltd.**  
Hensington Road, Woodstock, Oxford OX7 1JR, England  
Telephone (0993) 812700 Telex 83147 Ref. OCSL

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# VIC chip revealed

With the recent announcement by Commodore of their graphics competition, we take an in-depth look at the Commodore 64's VIC (Video Interface Controller) chip.

All graphics on the 64 are controlled using the 47 registers in the VIC chip. These registers control effects ranging from border and screen colour to complicated use of the raster interrupts.

The easiest format for using the VIC chip is to set a variable VIC=53248 and POKE to locations VIC+reg no.

We will now take a thorough look at each register.

## Register No. Use

- 0 Sprite 0 x position (0-255). Note with the x position, the high bit (i.e. values greater than 255) are controlled by register 16.
- 1 Sprite 0 y position (0-255).
- 2 Sprite 1 x.
- 3 Sprite 1 y.
- 4 Sprite 2 x.
- 5 Sprite 2 y.
- 6 Sprite 3 x.
- 7 Sprite 3 y.
- 8 Sprite 4 x.
- 9 Sprite 4 y.
- 10 Sprite 5 x.

11 Sprite 5 y.

12 Sprite 6 x.

13 Sprite 6 y.

14 Sprite 7 x.

15 Sprite 7 y.

16 MSBit of Sprite x position. Each bit corresponds to one of the 8 Sprites.

An example of how to put a Sprite co-ordinate into the appropriate registers is:

SP=Sprite no. (0-7)

X=x coord.

Y=y coord. (0-255)

VIC=53248

POKEVIC+SP\*2+1,Y : REM Y  
COORD

POKEVIC+SP\*2,XAND255 : REM X  
COORD

IFX>255THENPOKEVIC+16,PEEK-  
(VIC+16)OR2(to the power of)SP

IFX<=255THENPOKEVIC+16,-  
PEEK(VIC+16)AND(255-2(to the  
power of)SP)

# GRAPHICS

17 VIC control register.

Bit 7 Raster compare MSBit.

6 Extended colour mode:  
1 to enable  
0 to disable

5 Bit-map mode:  
1 to enable  
0 to disable

4 Blank screen to border colour:  
0 to blank  
1 to restore

3 Select 24/25 row screen:  
1=25 rows  
2-0 Smooth scroll vertical.

To smooth scroll to a vertical position (l=0 to 7) use command:

`POKEVIC + 17, (PEEK(VIC + 17) - AND248)ORI`

18 Raster compare LSByte.

19 Light-pen X position.

20 Light-pen Y position.

To read the light pen co-ordinates requires PEEKing the two locations into variables x and y. There is a conversion required to get the true value (in terms of the hi-res screen). These conversions are:

$x = (x - xoff) * 2; y = y - yoff$

Note: The values xoff and yoff are the values returned for the x and y values at the top left corner of the screen. These values vary for the different light pens on the market.

21 Sprite enable. Each bit corresponds to one of the 8 Sprites. 1=Sprite enabled.

22 Another VIC control register.  
Bit 7-6 Unused.

5 Always set to a zero (according to Programmers Reference Guide).

4 Multi-colour mode:  
1 to enable  
0 to disable

3 Select 38/40 column screen.  
1=40 column.  
2-0 Smooth scroll horizontally.

To smooth scroll to a horizontal position (l=0 to 7) use command:

`POKEVIC + 22, (PEEK(VIC + 22) - AND248)ORI`

23 Sprite expand in the y direction. Each bit corresponds to one of the 8 Sprites. 1=expanded.

24 VIC memory control register.  
Bits 4-7 Video matrix address.  
0-3 Character data address.

25 VIC interrupt flag register.  
Bit 7 Set on any interrupt produced by VIC chip.  
3 Light pen IRQ. 1=occurred.  
2 Sprite to sprite collision. 1 = occurred.  
1 Sprite to background collision. 1=occurred.  
0 Raster compare. 1=occurred.

When handling interrupts produced by the VIC chip, once they have been seen to, a 1 must be written to the correct bit to clear that interrupt.

- 26 IRQ enable register. Same bits as R25. 1=interrupt enabled.
- 27 Sprite to background priority. 0=Sprite in front.
- 28 Sprite Multi-colour mode. Each bit corresponds to one of the 8 Sprites. 1=Multi-colour.
- 29 Sprite expand in the x direction.
- 30 Sprite to Sprite collision register. Bits set correspond to the Sprites in collision.
- 31 Sprite to background collision register.

With registers 30 and 31, when read they are reset to zero.

- 32 Border colour.
- 33 Normal Background colour.
- 34 Optional colour 1.
- 35 Optional colour 2.
- 36 Optional colour 3.

The optional colours are used in extended or multi-colour character mode.

- 37 Sprite optional colour 1.
- 38 Sprite optional colour 2.

The sprite optional colours are used when Multi-colour Sprites are required. Note they will be the same for all 8 Sprites.

- 39 Sprite 0 colour.
- 40 Sprite 1 colour.
- 41 Sprite 2 colour.
- 42 Sprite 3 colour.
- 43 Sprite 4 colour.
- 44 Sprite 5 colour.
- 45 Sprite 6 colour.
- 46 Sprite 7 colour.

Now that we have covered all of the VIC chip registers, here is a brief explanation on how to produce Hi-res graphics.

For use of the VIC interrupts, we will refer you to the MARCH '84 Hints & Tips section.

## Hi-Res graphics

Hi-resolution graphics are obtained by entering a mode called bit mapped mode (see register no. 17). This is done by:

`POKEVIC+17,PEEK(VIC+17)OR32`

When this mode has been entered, the area that the bit mapped screen is going to take up must be determined. This area will be 8000 bytes in size. As the VIC chip can only access 16K in one go, the best place to put it is at the top end of that 16K ie 8192.

This is chosen by:

`POKEVIC+24,PEEK(VIC+24)OR8`

# GRAPHICS

If you have just done this, you should have a screen full of random dots in red on a black background. This is because the hi-res area is normally programming RAM and must be cleared.

To clear the hi-res area, use:

```
FORI=0TO7999:POKE8192+I,0:NEXT
```

The colour data for the plotted points are stored in 1K of RAM. This colour memory is located at the same place as the normal video screen ie 1024-2023.

To set the colour required, use:

```
SC=screen colour:PC=point colour  
FORI=0TO999:POKE1024+I,SC+-  
PC*16:NEXT
```

Now the 64 is set up to allow points to be plotted on it. The convention used in this article is that the x co-ordinates go from left to right with values between 0 and 319. The y values go down the screen (for ease of calculation) with values between 0 and 199.

To calculate the location in the bit mapped area corresponding to an x and y coordinate use:

```
BYTE=8192+INT(Y/8)*320+INT-  
(X/8)*8+(YAND7)
```

Once this has been calculated, the actual bit (pixel) in that byte must be calculated. This is done by:

```
BIT=7-(XAND7)
```

To plot the point x,y to the hires screen, use:

```
POKEBYTE,PEEK(BYTE)OR2(to the  
power of)BIT
```

To unplot that point, use:

```
POKEBYTE,PEEK(BYTE)AND(255-2(to  
the power of)BIT)
```

If multi-colour graphics are required, the above procedures are nearly correct with just the difference of the colour storage and the bit.

Added to the methods, for multi-colour:

```
POKEVIC+22,PEEK(VIC+22)OR16
```

Which puts the computer into multi-colour mode.

There are a few modifications required to the previously explained routines. These are: for the colour storage, the video screen now holds two of the plotted point colours, the background(screen) colour is from the normal screen colour register (VIC+33) and a third point colour is obtained from the colour RAM (55296-56295).

The last point to note for multi-colour mode hi-res is that because of the increase in the number of colours. There is a decrease in the resolution. The resolution is now only 0-159 in the x direction although you must still work to the 0-319 co-ordinates. Therefore, the bit calculations will be slightly different as two bits are needed for each point. The new bit calculation is:

```
BIT=INT(7-(XAND7)/2)*2
```

This returns the lower of the 2 bits required to plot a point. The colour of the point depends on whether each or either of the bits is switched on or off.

bit	bit+1	colour from
0	0	Screen register (VIC+33)
0	1	Upper 4 bits of video RAM.
1	0	Lower 4 bits of video RAM.
1	1	Colour memory.

Where 1=turned on and 0=turned off.

## Template

Solar Systems International have designed a product to make life much easier for the Visicalc user.

Learning to use a spreadsheet such as Visicalc can be a time consuming and difficult process. Planning the layout of a large template is difficult when only a few lines and columns are visible at any time on the VDU.

To eliminate the problem Solar Systems have produced a 81cm x 55cm grid with a wipe-clean surface for £5. This can be used to mark out the text and formulae for each entry and any project carried out on Visicalc can be planned in relation to the whole project.

**Contact:** Solar Systems International Ltd, 2nd Floor, Borough House, Rue de Pre, St Peter Port; Guernsey. Tel: 0481 64475.

Also producing templates for spreadsheets – Visicalc, SmartFile Spreadsheet, and Calc Result – are Chase Revel Inc, publishers of Entrepreneur Magazine.

**Contact:** Entrepreneur, 2311 Pontius Avenue, Los Angeles, CA 90064. Tel: 213 478 0437.

## Purchase ledger

Designed for the non-technical user, Anagram Systems have produced a new purchase ledger retailing at £75 for the CBM 64. It covers a wide range of business requirements.

Depending on information stored, up to 175 supplier accounts can be maintained with 50 nominal accounts having between four to 10 outstanding invoices per supplier. It can also be run with Anagrams' sales ledger package and stock control system.

**Contact:** Anagram Systems, 60a Queen Street, Horsham, West Sussex. Tel: 0403 59551.



## Tidy solution

Keeping floppy disks and computer printouts clean and in tidy order can be a problem. Inmac and Stralfor Data Products' binders provide a solution to these problems.

A hinged binder which stands up like an easel and a more conventional lie-flat design are both used for storing floppy disks and cost £7.50 and £4.50 respectively.

**Contact:** Inmac Ltd, Davy Road, Astmoor, Runcorn, Cheshire. Tel: 09285 67551.

Computer print outs can be stored in a ringbinder which takes listings up to 39 cm wide. These cost £2.15 each for a minimum order of 20.

**Contact:** Stralfor Data Products, 11 Techno Trading Estate, Swindon, Wilts. Tel: 0793 37837.

## Multiple speed

The Mark 2 Microfacts accounting software for Commodore can now support multiple users sharing common data files on a Corvus Winchester disk drive.

This product is intended for existing users who want to upgrade Microfact and increase its speed and capacity. The original accounting system is supplied by Facts Software, but Michael Johnson & Co, developed this multi user version under licence and are supporting and installing the system.

**Contact:** M. Johnson & Co, 3 Orchard Road, Pulloxhill, Beds. Tel: 0525 714444.

## All-in-one

Inmac, specialists in computer accessories, have launched a mobile works station designed to hold all your hardware requirements – keyboard, printer, computer, paper catch and paper feed.

Costing £285, this self contained unit has four wheels enabling mobility. Safety rails keep equipment relatively secure in transit. Cables are neatly tucked into slots and ducts, leaving only one mains plug and cable for connection. The work surface is 67cm high, 22cm wide and 76cm deep. Optional extras include drawers and a monitor shelf.

**Contact:** Inmac Ltd, Davy Road, Astmoor, Runcorn, Cheshire WA7 1PZ. Tel: 09285 67551.

## 64 range

Batteries Included, a Canadian company, have produced a range of business orientated products for the CBM 64.

The Consultant, a database which they claim is 'powerful and big', allows the user to design a layout to file information. Data can be sorted, analysed, stored and in addition, in-built routines mail labels and forms can be printed.

The Buscard II is an updated version of the original Buscard and transforms the CBM 64 into a business computer. Using this device, most Commodore compatible peripherals can be attached and will not be mismatched. It also gives the user extended Basic, ASCII and a full machine language monitor. Manual included.

The BI-80 column adaptor provides a wide column display to give optimum clarity to the CBM 64. It can be used with any monochrome video monitor and has the Basic 4.0 language.

Spellpack teaches the CBM 64 how to spell. The program checks a document for spelling errors in two to four minutes using its dictionary of over 20,000 words.

**Contact:** Batteries Included, 186 Queen Street, Toronto, Ontario, M5V 1Z1. Tel: 416 596 1405.

## BC back

The original BC-Basic came from BC Computers and was available on cassette and disk. Kuma have now taken over the distribution and their new and slightly improved version comes on a cartridge for the CBM 64, at the increased price of £57.50.

See our review of BC Basic in November issue for further details.

**Contact:** Kuma Computers Ltd, 12 Horseshoe Park, Pangbourne, Berks, RG8 7JW. Tel: 07357 4335.

# The Midas touch

**This month we look at SM Software's Golden Tool series of programs for the 64 which is aimed at general business users and those creating their own programs.**

SM Software are originally a German company and are well known as suppliers of software – mainly business software – for the PET, Sirius and Epson computers. Now they have produced a series of programs for the 64 which they have chosen to call Golden Tool.

So far they have produced five pieces of software in the series, three aimed at serious users who are likely to be involved in creating their own programs and two aimed at general business users.

The two general programs are Text 64 and CUDA 64 and both have been adapted from programs used on other machines. Text 64 is, as its name suggests, a wordprocessor. It's based on SM-Text which was originally developed for the PET, Sirius and Epsom. SM Software claim that if you need more features than Text 64 provides then it's not another piece of software you need but a bigger machine.

It's certainly an excellent word processor for the price (£50). It provides page widths up to 110 columns, a very useful text file handling facility and all the usual facilities that you would expect in a word processing program.

In places it's a little clumsy compared to some of the more expensive packages but we have come across expensive packages which are not as good as Text-64. One area where Text-64 excels is in the use of function keys. Selecting the function keys in some parts of this menu driven program leads to a choice of further 'sub-functions'.

The scrolling facilities are good but do not make up for the rather meagre 40 column screen of the 64 – not too much of a problem for most, perhaps, but for those who use a word processor often it's a definite disadvantage. Working with 80 columns using the Text-64 means that the screen scrolls horizontally when the cursor reaches columns 36, 51 and 66. This can be quite disconcerting because the text jumps suddenly to the left.

The manual leaves something to be

desired. It's not as bad as some but it does give the impression that although it's been translated from another language very competently it hasn't been given to a native Englishman (or American or Australian!) to read. The odd little idiosyncrasy gives the game away. The manual should take more of an educational role. SM Software need to take a look at the Superscript manual. As it stands the Text 64 manual is little more than a list of extra commands and what they mean.

We obviously have not been able to test all the facilities that SM Software claim for Text 64 but it looks like good value for money.

CUDA 64 is an example of a well put together small database management system. Basically it is a card index program for filing names and addresses. It has been adapted from SM-CUDA which formed part of SM-IBIS, a powerful integrated business system for use on the Commodore 8000 and Sirius computers.

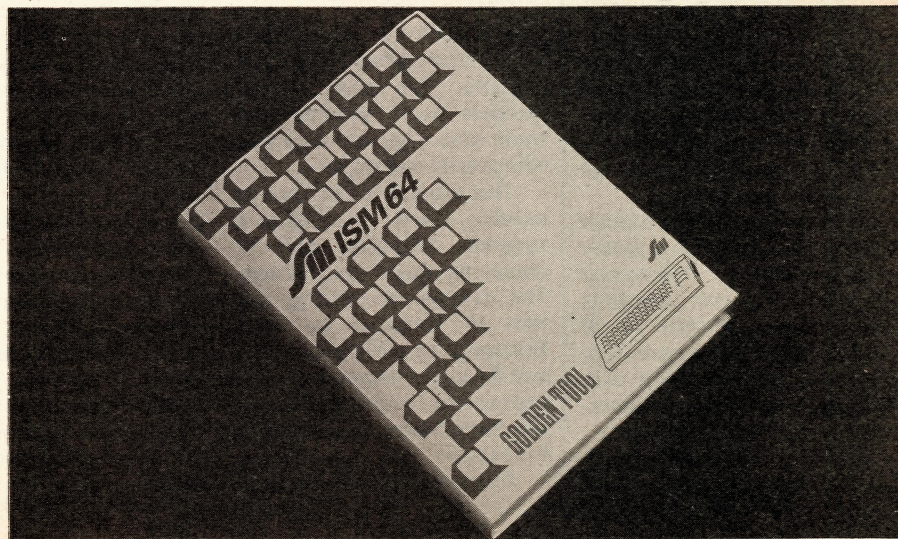
There's scope for more than 600 records on each disk and each record holds eight fields. Each record has a number and a keyfield (SM call it a 'search name'). Personal name, orga-

nisation name, four lines of address, telephone, telex and several lines of notes can also be entered.

Anyone familiar with DBMS's will see immediately that this is not the most complicated or comprehensive program but it is neat, simple and concise. It is fairly user friendly and will probably be used for small businesses or for personal use. At £40 it is reasonably priced but we did feel that the search facilities are rather restricted.

The next three packages are aimed at serious 64 users. ISM 64, MAE 64 and KIT 64 are all tools or utilities and are obviously intended for use by amateur and professional programmers. ISM 64 is aimed at programmers working in a business where it is necessary to create files while KIT 64 is a toolkit which would be useful for both amateur and professional programmers. MAE 64, however, is for the advanced, probably professional, programmer.

The full name for ISM 64 is Index Sequential Manager and it is described as an advanced file handling system. It is basically a collection of BASIC commands that form a complete disk file management system. It is an impressive program though difficult to handle for



# BUSINESS SOFTWARE

those unfamiliar with programming or files. It consists of a 6502 machine code program which takes up something like 15K of RAM. A useful piece of software but with specialist applications.

KIT 64 has been developed from SM KIT which was developed for the PET series. There are three main facilities: debugging, structuring and testing for BASIC programs; error detection and display; and a facility which enables you to see exactly what is going on in the disk drive. This is another piece of software which obviously is only of use to programmers.

MAE 64 is not, as SM emphasise themselves, any good for beginners. A good knowledge of 6502 assembler language is essential. It is an editor/assembler, the aim of which is to relieve the programmer of many of the chores associated with low level programming.

It is a complicated and powerful piece of software which provides facilities more commonly found on mini or mainframe computers. An advanced machine code monitor is included for program testing and 24 extended commands allow disassembly, load, save and memory moves and so-on. Very useful for the experts.

**Series Name:** Golden Tool.  
**Company:** SM Software (UK) Ltd.  
**Address:** Raglan House, 56 Long Street, Dursley, Gloucestershire.  
**Telephone:** (0453) 46065.

**Name:** Text 64.  
**Description:** Word processor program.  
**Applications:** Business and personal word processing.  
**Documentation:** Only adequate.  
**Minimum Hardware:** 64, 1541 or 4040 disk drive, Commodore or ASCII printer.  
**Features:** Good use of function keys and good text file handling capability.  
**Price:** £50.

**Name:** CUDA 64.  
**Description:** Name and address database.  
**Applications:** Smaller businesses, personal use in larger business or at home.  
**Documentation:** Scant but adequate.  
**Minimum Hardware:** 64, 1541 or 4040 disk drive, Commodore or ASCII printer.  
**Features:** 600 records with eight fields.  
**Price:** £40

**Name:** ISM 64.  
**Description:** Index Sequential File Manager.  
**Applications:** Business file creation.  
**Documentation:** Reasonable.  
**Minimum Hardware:** 64, 1541 or 4040 disk drive.  
**Features:** See text.  
**Price:** £40.

**Name:** KIT 64.  
**Description:** Tool kit.  
**Applications:** For programmers using BASIC.  
**Documentation:** Good.  
**Minimum Hardware:** 64, 1541 or 4040 disk drive, Commodore or ASCII printer.  
**Features:** See text.  
**Price:** £40.

**Name:** MAE 64.  
**Description:** Editor/Assembler.  
**Applications:** For advanced programmers.  
**Documentation:** Good.  
**Minimum Hardware:** 64, 1541 or 4040 disk drive, 80 column printer.  
**Features:** See text.  
**Price:** £40.



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- ★ Extra RAM in system bank.
- ★ Comprehensive manual.

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**JCL SOFTWARE**  
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# VIZASTAR 64

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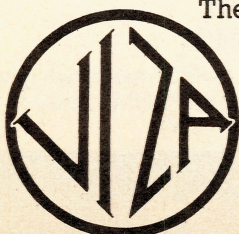
VizaStar has been designed to incorporate the very latest in user-friendliness - so now you can handle your all-important information in many new ways and in a quick and effective manner.

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an ordered and instantly retrievable form. This means that you can quickly pick out individual or entire groups of related information to create lists, statements, labels or reports.

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AVAILABLE NOW - VIZASTAR 64  
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# Plotting Fine detail

This month we look at two related products for the business market. Pragma's Printronix 4160 is a plotter suited to scientific and engineering applications and Licom's UPI connects a printer or other peripherals (like the Printronix) to a computer.

Licom's Universal Printer Interface is designed to make simple the connection of a printer and other peripherals, such as a plotter, to a computer. It is aimed at any business involved with word processing, printing and plotting.

This printer interface, which has a 12 month repair or exchange warranty, has a single address IEEE488 input. The address can be anywhere between 0 and 31.

Unlike many printer interfaces, this one from Licom has two forms of output – serial, through the D25 socket, and parallel. Some applications will require that both output ports are in operation simultaneously, for example, the connection of the Universal Printer Interface to a parallel printer or a disk drive and serial plotter.

All of these interfacing sockets are found at the back of the printer. The Centronics interfacing port is not a card

edge connector as more commonly associated with the RAM packs, although it is possible to buy an adaptor to convert it. However, it is still possible to select serial or parallel output, or both for simultaneous output.

Two switches control the selection of output. These are situated on the front panel and screen LED indicators show which output is in operation. During operation, output can be switched from printer to printer as required. For instance, in word processing applications it may be necessary to link the interface to a parallel dot matrix printer for internal office documents as well as hooking it up to a serial daisy wheel printer for those items that require letter quality printing.

The transfer of data can be limited to about 100 characters per second regardless of which form of output is being used to allow 'background' printing and

maximum baud rate is 9600.

There are two ways to convert PET codes to ASCII. Firstly by opening the printer using 4,4,1 (1 being the secondary address), and secondly by turning the printer interface upside-down to gain access to switches which relate to PET/ASCII conversion. With either method, setting the hardware to convert PET to ASCII is a very simple task.

**Product:**

Universal Printer Interface

**Price:**

£225

**Features:**

Input – Standard addressable IEEE 488 socket

Serial output – standard D25 socket;  
Subset of RS232C protocol

Baud rates – 110, 150, 300, 600, 1200, 2400, 4800 or 9600

Character length – 5, 6, 7 or 8 bits per character

Stop bits – 1, 1.5 or 2

Parity – Even, Odd or None

Parallel output – Standard 'Centronics' D36 socket

Both outputs – data rate can be set to 100 cps to allow 'background' printing with WORDCRAFT

UPI can be set to convert PET codes to true ASCII

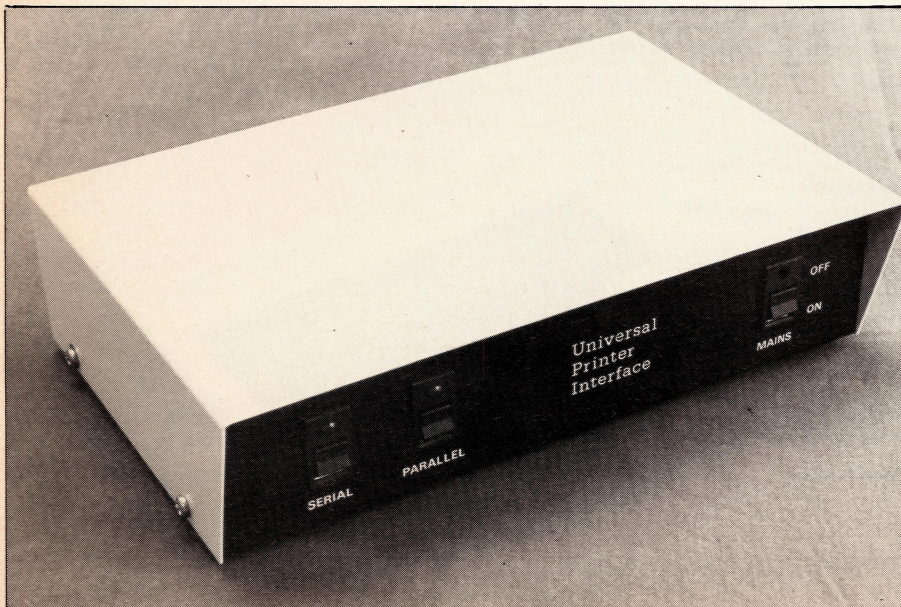
Warranty – 12 month repair or exchange on return to Licom

**Compatibility**

Any micro using IEEE 488 and any printer, disk drive, plotter etc, that uses parallel and serial output

**Contact:**

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# CBM's Flower-power

**Gardening by computer may seem to be one of those applications that's just a little too far fetched to be true. However, down in deepest Sussex they're using Commodore machines to keep everything in the garden (and the bank account) lovely!**

Old Barklye Nurseries specialises in selling exotic and everyday houseplants, growing some of their own and importing the rest from all over the world. Not only that, the nurseries can claim some pioneering work in horticulture with their development of a special method of growing poinsettias, preparing them for winter and central heating.

Keeping track of orders, deliveries and invoices was a hard enough task without the extra complications of a maze of freighting and exchange rate problems all of which had to be taken into account before pricing the plants. Brian and Colin Atkinson knew that there must be a computer system somewhere that would help them cope with this headache.

Brian had already experimented with a microcomputer, using a Pet to optimise consumption of energy in the nurseries. He processed data on different tariff rates as an aid to buying the right amount of power at the right rate and time.

Now it was time to become Britain's first fully computerised nursery by introducing microcomputer efficiency into other areas of business administration.

Brian looked at the range of computers open to him, and saw a number of attractive machines between £3,000 and £4,000 that had enough power. But he was not sure that the complex tasks would be handled to his satisfaction.

A leap in the dark for that kind of money was not worth the risk. Instead Brian opted for the Commodore 64, with a number of software packages. After trying out a succession of programs, with which he was not impressed, he finally found what he was looking for in PractiCalc, Computer Software Associates' spreadsheet from Ipswich-based UK distributors, Marketing Micro Software Ltd.

"We looked at a lot of spreadsheets,"



**Brian and Colin Atkinson with one of the four 64's they use in their nursery business.**

says Brian. "Since most cost over £100 you have to make the right choice, especially with a staff that isn't used to computers. They all looked fine in principle, but very complicated and daunting to actually put into practice, until I came across a review of PractiCalc and sent off for a copy."

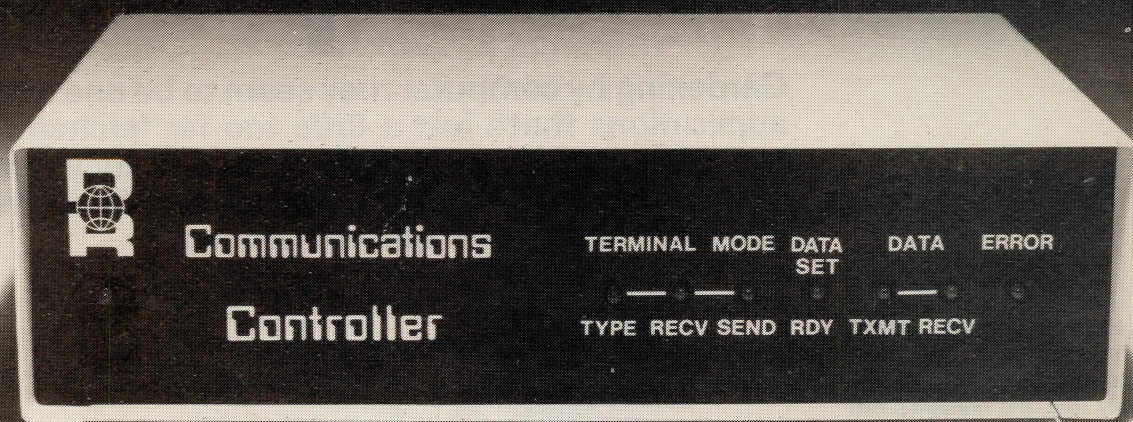
In fact Brian was so taken with the 64 that he now has four Commodores doing different jobs around the nurseries.

On one micro he uses PractiCalc to estimate and prepare price lists, taking into account exchange rates, discounts, freight costs and so on, and on another the program is used for a complicated entry system on orders. Then he has one machine purely for staff 'acclimatisation', and the fourth he is using to take over from the Commodore Pet on his unique energy control system.

Available on disc and cassette for the Commodore 64 at under half the price of

most spreadsheets, PractiCalc offers a full four colour, clear on-screen display and performs a number of unique and sophisticated functions not usually found in this price range. For example it has a 'seek and search' facility for the whole or parts of the spreadsheet, a choice of alphabetical or numeric 'sort' from highest to lowest or vice versa, a wide range of over 20 maths functions and a versatile graphics facility. With a great deal of complicated data to process, Brian Atkinson and his staff find the range of sorting options and the system's fast 'go to' function particularly useful.

"The use this program has been put to has been quite amazing. It has repaid the original cost very many times over," he commented. Because it is easy to use, PractiCalc has caused few problems. Beginners questions were efficiently answered by Marketing Micro Software who offered a 'first class service'.



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The full capabilities of the Commodore 8000 series are available for purely local applications offline.

The controller is simple to install, and the system is configured by selecting options from the screen menu. Error recovery routines are included in the software for most conditions, and a dump facility allows diagnosis if a condition arises where automatic recovery is impossible.

The Communications Controller requires a Commodore 8000 series and disk drives. Workstation emulations are: IBM 3270 and 2780/3780; ICL 7181, 7501 and 7502.

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# Send it down the line

**Many people now use their personal computers to communicate, through a modem, with bulletin board systems, information services, mainframe computers and other personal computers. Speculative films like Wargames are becoming reality as computer whizz kids rob banks, obtain access to highly sensitive government information and generally prove that anything is possible in Telecommunications. This month Commodore Computing International provides a buyers guide to modems, explaining modem terminology and listing a selection of Commodore-compatible modems.**

What exactly does a modem do? Think of a conversation between a French and an English man. Neither will even attempt to speak the others 'foreign' language, but in this example it is essential that they communicate. What can they do? The only short term solution is to introduce an interpreter willing to translate the conversation for both men. This situation is analogous to the computer, telephone line and the modem, the modem being the interpreter converting the computers language into one familiar to the telephone.

'Modem' is actually a shortened version of the two words describing its function: MOdulator and DEModulator. The computer uses a binary signal system and the telephone lines use and comprehend audio-frequency signals. In the first part of the process - modulation - the computers binary signals are converted to the analogue signals understood by the telephone lines, sounds rather than digital pulses. In the opposite process - demodulation - the telephones' audio signals are converted into the electrical impulses of the computer.

Modems can be connected to the telephone system either by direct electrical connection or by acoustic coupling. The acoustic coupler has the advantage of being cheaper, electrically isolated and easier to connect, but it is affected by background noise which can corrupt incoming and outgoing data. It has a cradle and two rubber cups to accommodate the handset. In one cup the loudspeaker generates an audio tone and passes it along the telephone line. Signals are received by the microphone in the coupler and changed into binary pulses for the computers

comprehension.

The other type of connection is a two or four hardwire connection which uses a socket installed by British Telecom.

Connecting the modem to the General Switched Telephone Network (GSTN) can be expensive if used frequently because the user pays at the same rate as private telephone calls. Some of the modems can be connected to leased lines - private lines rented out by British Telecom, and these are cheaper to run.

How does the system work? To pass a message from your computer, the micro has to send a character to the modem interface. The modem acts as a terminal. The computer at the other end - massive central computer or another home computer - may not recognise the characters and codes that your own micro uses and will need to be told how to deal with any special system, such as Prestel. Software provides the instructions the computer needs to act as a terminal.

A cable is needed to link the modem to the computer. Most modems use an RS232C or RS423 interface but unfortunately for Commodore users, neither the 64 or VIC-20 deliver the correct signal, so the RS232 signal has to be buffered or inverted. Bear these additional requirements in mind when considering the purchase of a modem because they could cost more than the modem itself.

Modems are rated according to the speed in which they receive and send data. Speed is usually described as 'bits per second' (bps) or baud rate. Modems at each end of a system must send and receive data at the same speed otherwise they can not communicate. Standards have emerged and three of the

most common ones in use are as follows: The 300/300, where both micros transmit and receive at 300 bps; 1200/75 bps, with the host transmitting at 1200 bps and the user terminal transmitting at 75 bps, and similarly the 75/1200 where the host transmits at 75 bps and the user transmits at 1200 bps. (Both these speeds are utilised by Prestel and Viewdata.) Finally the 1200/1200 where both transmit and receive at 1200 bps.

Some of the more sophisticated models can transmit in all these speeds. Modems can transmit data at up to 19200 bps depending on the distance over which the data is transmitted, but these are not generally for home use. Check what speed the modem of the system you intend to use runs at before investing.

Two different audio tones are used when computers communicate with each other. The sender, who is usually in originate mode, transmits at 980 or 1180 Hz and the receiver, usually in answer mode, transmits in 650 or 1850 Hz. This ensures that the modem doesn't start receiving its own transmissions. The main physical difference between the two modes is that in answer mode the modem speaks with a steady tone known as a carrier and the other modem will wait to hear the carrier before replying with its own carrier tone.

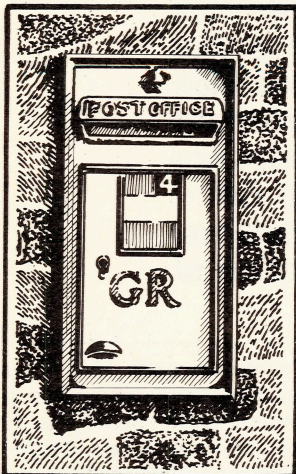
Two modems cannot communicate if they are both in answer or in originate mode. Most of the central or host computers are in answer mode to receive calls from subscribers, so the terminal end should be in the originate mode. A modem capable of switching between the two modes would be the best option.

Another consideration when choos-

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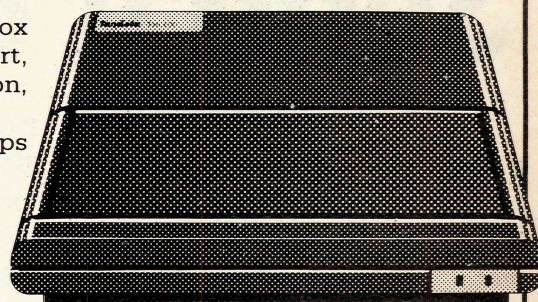


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CC1/484

# Simple connections

In the conventional sense, the Printronix 4160 is not a printer/plotter – simply because it is not like most plotters. It does not have a flatbed or a drum, has no pens and can only print in black. Why then, have Pragma chosen to market it as a plotter? The answer is simple, it can plot, but it does so with a bank of 68 hammers mounted on a shuttle. These sweep back and forwards across the paper printing a very high density of dots onto the paper in a graphic or print form – whatever is specified by the controlling program.

The 4160 is especially suitable for

scientific and engineering applications. The fine dot diameter combined with the dot density of 160 dots per inch mean that very fine lines and small characters can be produced. Detailed drawings, bar charts etc can be produced very quickly and efficiently, for instance a detailed A-size drawing can be completed in approximately 40 seconds. Two print modes are available. In the character mode, dot patterns specified by ASCII codes in the input buffer are taken from the character generator and sent to the line buffer for character printing. The plot mode uses a similar process, but

bypasses the character generator.

It has no 'intelligent' functions, but a warning button on the control panel informs the user on a number basis what is wrong, for example '1' means the paper has run out. In addition if a plot row contains more than 35% block dots it will slow down so that overheating does not occur.

Visually the printer is attractive with its cream compact casing. An acoustic cover reduces the printing noise and the whole printer is surprisingly lightweight.

## Product Name:

Printronix 4160

## Product:

Plotter/printer

## Price:

£4637

## Features:

Shuttle mechanism with 68 hammers  
Letter quality print  
High resolution printer & plotter function

## Print Functions:

Print speed 130 LPM  
Plot mode: 2300 dot rows per minute  
Bi-directional printing  
Print matrix: 11 x 16 upper case & 11 x 20 including true descenders  
Character size: 0.07" x 0.1"  
Vertical format: 6 or 8 LPM

Character sets: ASCII 96 characters  
OCR-B

Font standard & up to 160 characters with optional fonts  
0.01" dot diameter

Dot resolution 160DPI x 168DPI  
Print density of 26,880 dots/in<sup>2</sup>

## Other features:

Black ribbon only  
Fanfold paper 3.5 – 16" wide  
Tractor feed paper drive  
Form feed control TOP (top of form) & PA (paper advance)  
Reset control  
Alarm control

## Size:

10.8"H x 24.4"W x 19.5"D

## Weight:

78 lbs

## Interface Format:

8 bit parallel, Centronics compatible

## Additional:

Interface to convert the CBM 64 & VIC 20

## Requirements:

Serial or IEEE ports to Centronics/  
parallel interface to convert 8000 series  
IEEE to Centronics

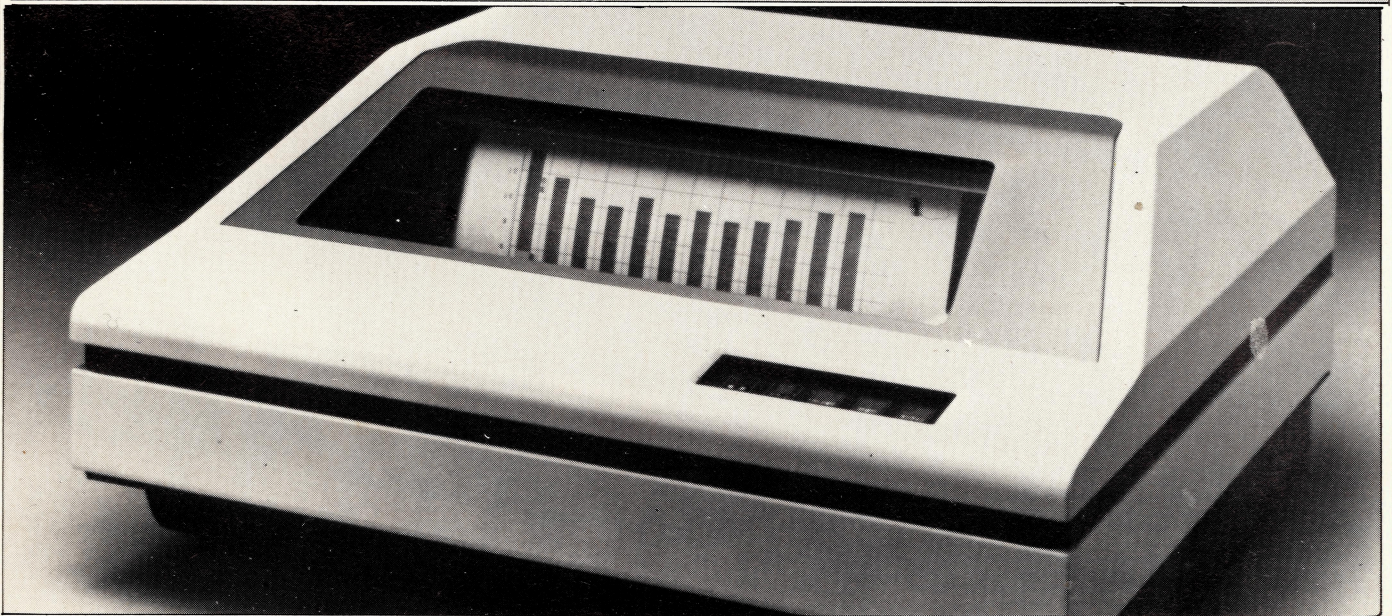
Best option is an interface converting the  
user port on all micros to Centronics

## Applications:

Engineering and Scientific

## Contact:

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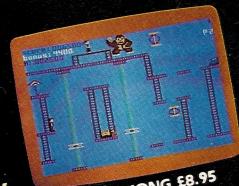
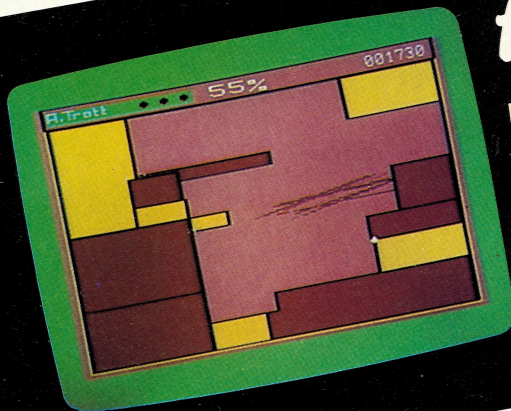


# SUPERSOFT

*the name to remember*

## for games

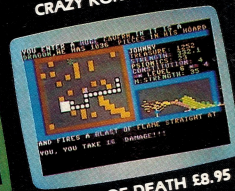
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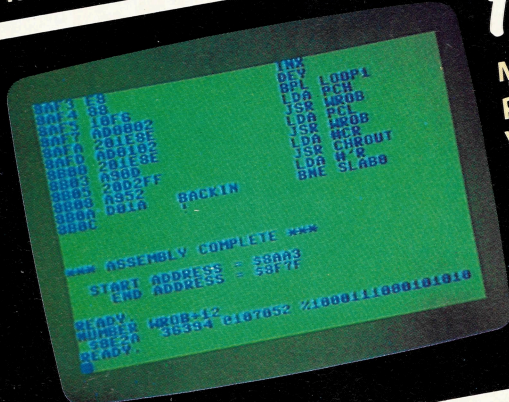
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<b>NET CASH FLOW</b>			
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<b>BANK BALANCE</b>			
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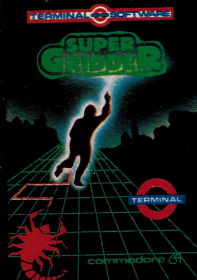
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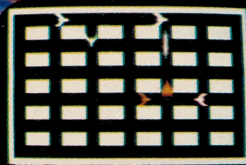
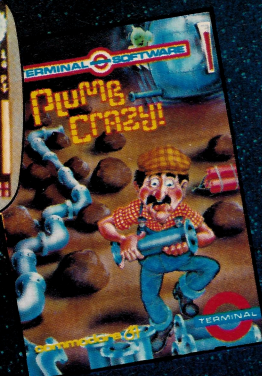
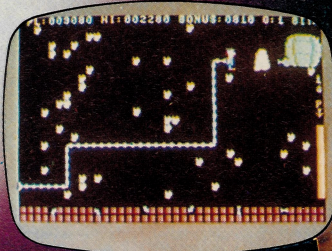
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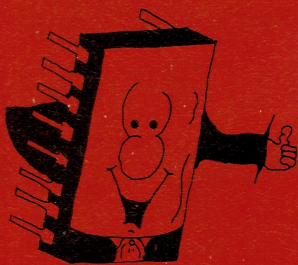
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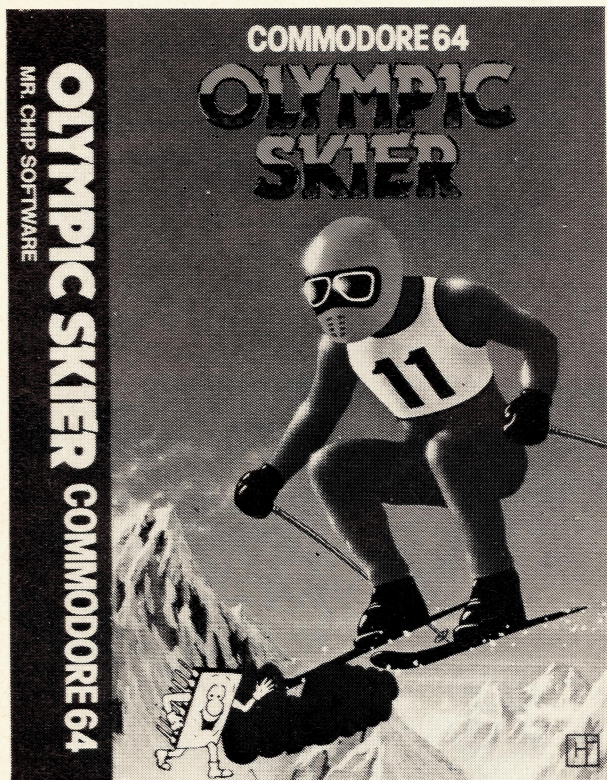
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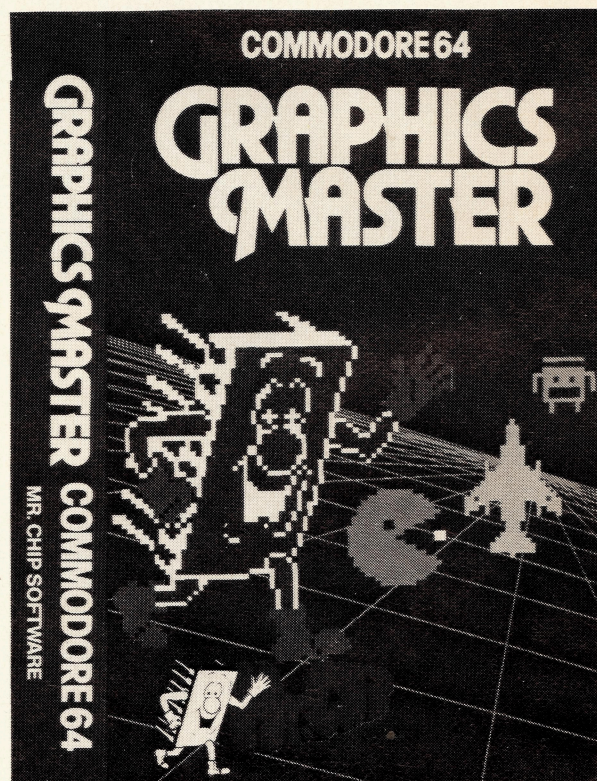
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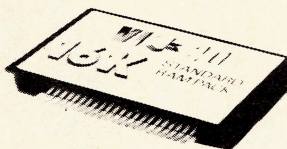
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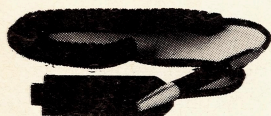
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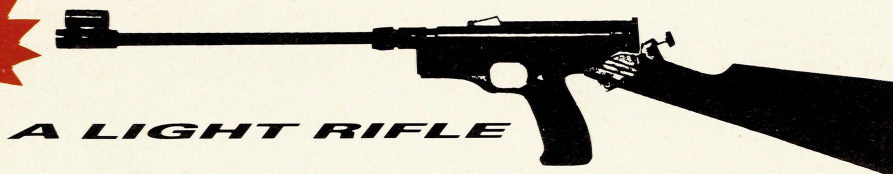
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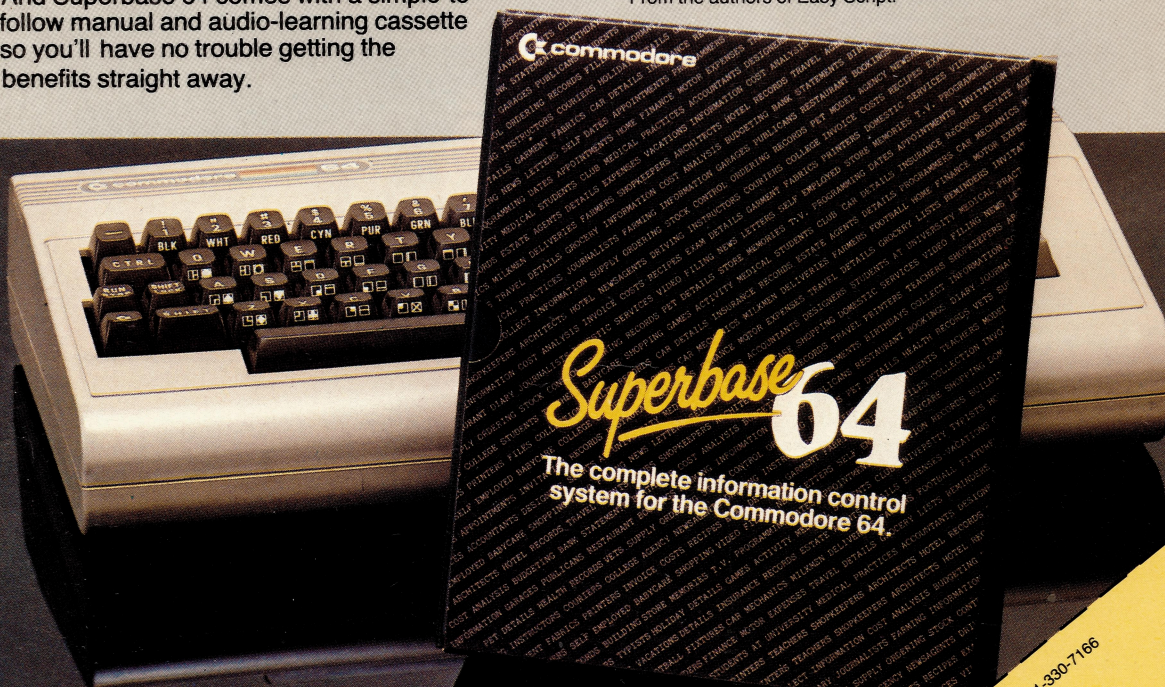


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# BUYERSGUIDE

ing modems is whether they are duplex or only half duplex. In half duplex mode the system will only allow one computer to talk at any one time. This is fine unless you suddenly realise that the wrong instructions have been given and you are getting details of the Dow Jones Index rather than information on trekking through the Himalayas. The user would have to wait until the computer had finished and then renew the instructions. Full duplex means that it would be possible to communicate with the other end and tell the computer to stop, like a telephone conversation (also more expensive).

Computers process information at a much greater speed than the modem. Those that have been synchronised to the computers clock pulse allow much faster data transfer. Otherwise the modem is asynchronous and contains a store which keeps computer generated data for processing at its own slower pace.

Many of the more recent modems, in the cheaper as well as the more expensive price bracket, have 'luxury' features incorporated into them. These make the operators life much easier. Dialling an engaged number fifty times isn't much fun! Originally the user had to dial the number of another computer, listen for the carrier, pass the carrier to the modem, identify himself and then 'log on'. Facilities available include the auto answer function which answers the phone and prepares to receive instructions without need for any human assistance. Useful when running a local network or calling your computer from a remote location. The auto dial facility is self explanatory and auto recall will try to contact any unobtainable numbers. Some modems have a menu of alternative numbers and can store ID numbers and passwords necessary for access into the networks.

Intelligent is a word increasingly used to describe some of the modems. This doesn't mean that they are rational machines with IQ's of genius proportions, but that they contain microprocessors designed to select different speeds automatically. The modem interface can be set to most of the standard speeds which enable it to work in networks supporting both local and dial-up terminals such as Viewdata.

A very useful facility in some of the modems, especially for non technical users, is a self testing function. One of the methods of achieving this is a loop back system that checks the signals and corrects them. As often as not, the telephone lines are at fault and line noise – clicks and bangs – could sabotage the

signal conversion process. The error detection and correction scheme checks all incoming data and automatically changes or eliminates any offending material.

Kits are available which provide all the necessary parts needed to make a modem. However unless you are experienced with building integrated circuits and soldering tiny heat sensitive parts onto a circuit board it is probably wiser to spend that little bit extra on an assembled modem.

Potential buyers should check that their modems conform to recommendations specified by the Consultative Committee on International Telegraphy and Telephony (CCITT), a body set up to set and maintain standards in the modem industry. All modems conforming to CCITT criterion will be interconnectable and networks all over the world could potentially link up with the exception of the USA which has its own system – the Bell which does not work with European systems.

A green sticker is a sign of approval from British Telecom who check that each modem conforms to their safety standards. Incorrect signals on the lines could be very dangerous and the transmitted frequency of acoustic couplers must not be higher than the human voice (3kHz). All the modems we have mentioned have the approval of British Telecom. Hard wired modems must be fitted by BT and any home made device must be checked to ensure that it is not a hazard to either the user or the network.

Another consideration that should be taken into account is a company's reputation for reliability. If there is no chance of asking an existing user about their experiences with a modem, then a guarantee for after sales customer service should be sought. Modems can go wrong and technical support will be essential.

Telecommunications is beginning to be much more widely understood and utilised by the consumer as well as by the business person. There is no doubt that they expand the scope of a home computer and the potential of the modem in business is staggering. Services available include home banking, Micronet 80, Tele-shopping, Citiservice, Viewfax 258, Electronic Mailing System.

Our list of modems is by no means exhaustive, but we hope it serves as a guide to what is available on the market. If you need more information about a specific modem, contact the relevant manufacturer. Tandata produce a useful leaflet on Modems which is obtainable on request.



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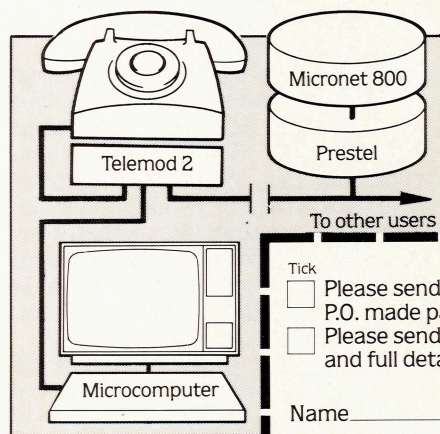
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# BUYERSGUIDE

MODEM	A211	AM211	AJ311	400/213	460/22	440/12	490/48	Buzzbox DSL21	DSL 2123
Manufacturer	Anderson Jacobson	Anderson Jacobson	Anderson Jacobson	Case	Case	Case	Case	DaCom Systems Ltd	DaCom Systems Ltd
CCITT Standard	V.21	V.21	V.21	V.21/V.23	V.24/V.28 RS 232 C	V.23	V.27	V.21	V.21/V.23
Coupling Method	acoustic	direct/ acoustic	acoustic	direct	direct	direct	direct	direct	direct
Baud Rate	300	300	300	300, 1200/75 1200/1200	300, 600 1200	1200, 75/ 1200	4800	300	300; 75/1200; 1200/75; 1200
Duplexing	half/full	half/full	half/full	half/full	full	half/full	half/full	full	half/full
Data Format	originate asynchronous	originate asynchronous	originate/ answer	originate/ answer asynchronous	synchronous asynchronous	asynchronous	synchronous	answer/ originate	asynchron- ous
Auto Answer	no	no	no	yes	yes	yes	yes	yes	yes
Auto Dial	no	no	no	yes	yes	yes	yes	yes	yes
Self Test	no	no	no	yes	yes	yes	yes	yes	yes
Power Supply	190-250 V	190-250 V	115-230 V	240 V	198-240 V	220-240 V	230 V	PP3 batteries/ mains adaptor	240 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	—	1 year
Other	—	—	—	rackmount	rackmount Bell compatible	—	rackmount	—	rackmount
Price (£)	229	279	279	295	625	695	1700	79.95	268

MODEM	KN 803	Portman	Mini LDS 122	LDM 414/ RM 3414	LDM 404/ RM 3404	3300 V.21	SR202	4801 MP	9620/V.29
Manufacturer	Duplex Communica- tions	Duplex Communica- tions	Gandalf	Gandalf	Gandalf	IAL	IAL	IAL	IAL
CCITT Standard	V.21/V.23	V.21/V.23	V.24/V.28	V.24/V.28 RS 232 C	V.24/V.28 RS 232 C	V.21	V.24/V.28	V.27 bis/ter	V.24; V.28 V.29
Coupling Method	acoustic	direct	direct	direct	direct	direct	direct	direct	direct
Baud Rate	300	300; 1200/75; 75/2000; 1200; Bell 103/202	50-9600	2400; 4800	4800	300	2400; 4800; 9600; 19.2k	2,400; 4,800	9600/4800; 7200/4800
Duplexing	half/full	half/full	full	full	full	half/full	half/full	half/full	half/full
Data Format	originate	originate	asynchronous	synchronous	asynchronous	asynchronous	synchronous	synchronous	—
Auto Answer	yes	yes	no	no	no	yes	no	yes	yes
Auto Dial	yes	yes	no	no	no	no	no	no	no
Self Test	yes	yes	no	yes	yes	yes	yes	yes	yes
Power Supply	mains/battery	190-225 V	host	240 V	115 V	240 V	240 V	240 V	240 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Other	4 versions available	Bell compatible rackmount	7 Km range	80-250km range RM3414 is rackmount version	80Km range RM3404 is rackmount version	auto fallback	rackmount range up to 10 miles	auto fallback microprocessor changes speed	auto fallback rackmount
Price (£)	250	—	—	—	—	330	520	995	1485

# BUYERSGUIDE

MODEM	Modem Kit	Linemaster	MS 2123	3001A	Interfibre FD 192	Interdriver LD 968	M321L	M1223	Telemod 2
Manufacturer	Maplin	Master Systems	Master Systems	Modular Technology	Modular Technology	Modular Technology	Modular Technology	Modular Technology	O E Ltd
CCITT Standard	—	n/a	V.21/V.23	V.21	V.24/V.28	V.24 RS 232 C	V.21	V.23	V.23
Coupling Method	direct	direct	direct	acoustic	direct	direct	direct	direct	direct
Baud Rate	300	up to 9,600	300; 75/1200; 1200; 75; 1200	300	up to 19,200	up to 9,600	300	1200	1200/75; 1200
Duplexing	half/full	full	half/full	half	—	half/full	full	half/full	full
Data Format	answer/ originate	synchronous/ asynchronous	asynchronous	answer	synchronous asynchronous	synchronous	asynchronous answer/ originate	synchronous/ asynchronous answer/ originate	asynchro- nous
Auto Answer	yes	no	yes	no	no	no	yes	yes	no
Auto Dial	no	no	yes	no	no	no	yes	yes	no
Self Test	yes	no	yes	no	yes	yes	yes	yes	yes
Power Supply	240 V	240 V	240 V	240 V	9 V	190-260 V	190-265	190-265	240 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Other	—	in house use only	Bell compatible — cable 4 or 8	—	—	range up to 5 Km	—	—	—
Price (£)	39.95	250	235	149	149	240	185	190	84.95
MODEM	Buzzbox	2123 GT	TM 100	TM 200	micro SRM-6	DM 321 D	DM 540	DM 2426 D	DS 2857
Manufacturer	Scicon	Scicon	Tandata	Tandata	Tech-Nel	Tech-Nel	Tech-Nel	Tech-Nel	Timeplex
CCITT Standard	V.21	V.21/V.23	V.23	V.23	V.24	V.21	V.24/V.28	V.26	V.24/V.28
Coupling Method	direct	direct	direct	direct	direct	direct	direct	direct	direct
Baud Rate	300	300; 1200/75; 75/1200; 1200	1200/75	300; 1200/75; 1200/75; 1200	up to 19,200	300	600-19,200	1200; 2400	600-19,200
Duplexing	full	half/full	full	half/full	full	full	half/full	half/full	full
Data Format	answer/ originate	answer/ originate		answer/ originate	asynchronous	answer/ originate asynchronous	answer/ originate synchronous/ asynchronous	synchronous	synchronous/ asynchro- nous
Auto Answer	no	yes	yes	yes	no	no	no	no	no
Auto Dial	no	yes	yes	yes	no	no	no	no	no
Self Test	no	yes	yes	yes	no	no	no	no	yes
Power Supply	batteries mains	240 V	240 V	240 V	batteries mains	190-265 V	100-125 V/ 200-250 V	190-265 V	220 V
Warranty	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Other	pocket-sized	microprocessor converts speed	auto recall stores 8 ID numbers or passwords	auto recall stores 8 ID numbers or passwords	5 Km range	—	rackmount	rackmount	25 Km range
Price (£)	69.50	498	86	217	pair - 99	327	425	499	315

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**Case:** Caxton Way, Watford Business Park, Watford, Herts WD18XH. Tel: 0923 33500.

**DaCom Systems:** 16 Alston Drive, Bradwell Abbey, Milton Keynes MK13 9HA. Tel: 0908 311885.

**Duplex Communications:** 52 High Street, Stock, Essex. Tel: 0277 841011.

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**IAL:** Aeradio House, Hayes Road, Southall, Middx UB25NJ. Tel: 01 843 2411.

**Maplin Electronics:** PO Box 3, Rayleigh, Essex SS68LR. Tel: 0702 552911.

**Master Systems:** 100 Park Street, Camberley, Surrey GU153NY. Tel: 0276 685385.

**Modular Technology:** Zygat House, Telford Road, Bicester, Oxon OX60XB. Tel: 0869 253361.

**OE Ltd:** North Point, Gilwilly Industrial Estate, Penrith, Cumbria CA11 9BN. Tel: 0768 66748.

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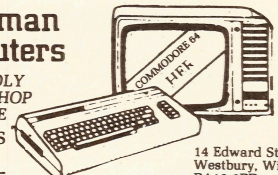
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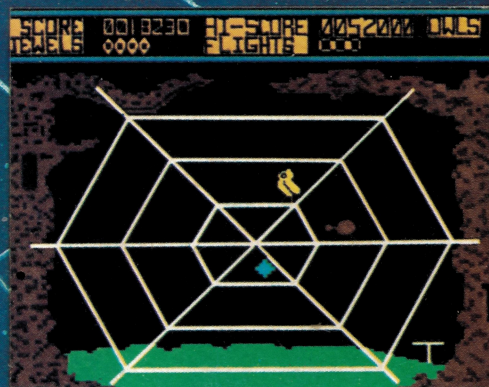
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